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Railway & Commercial Gazette

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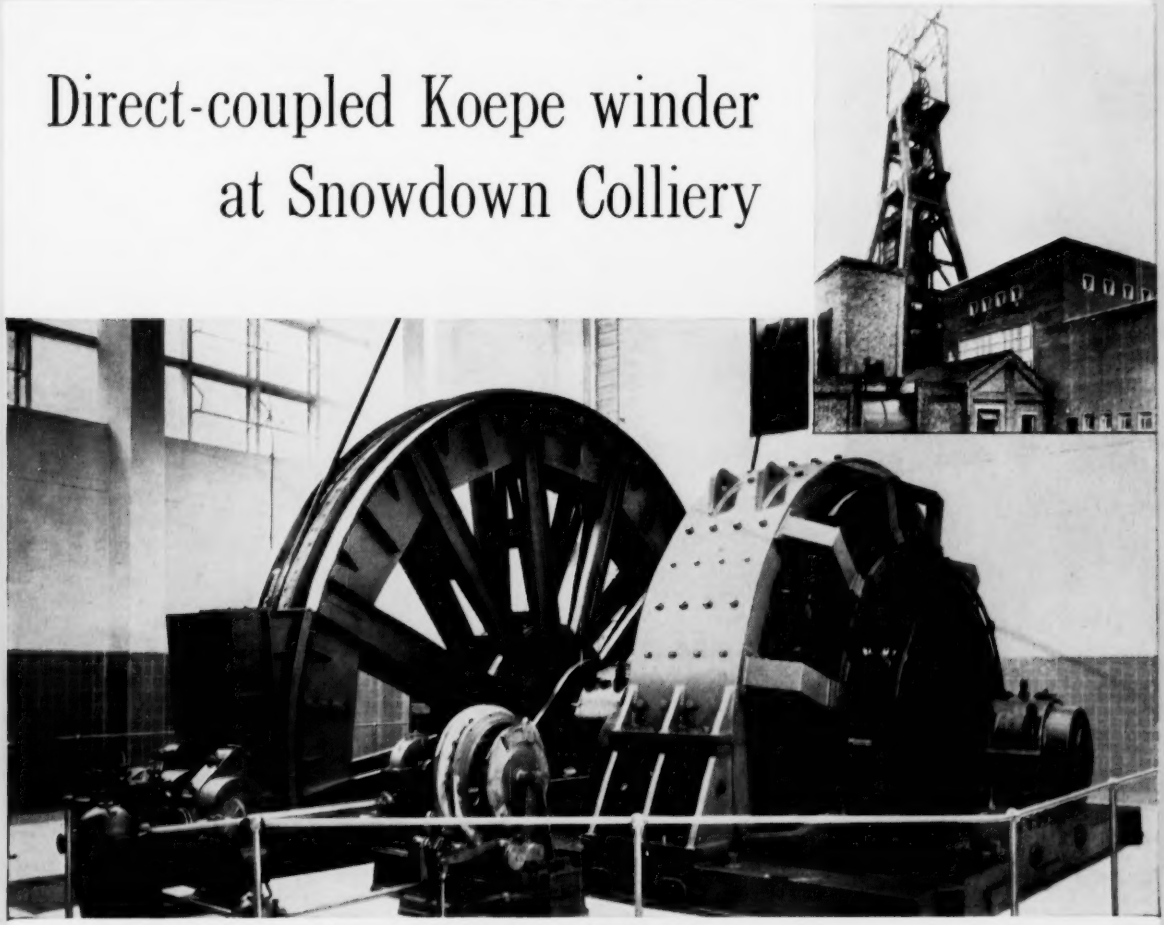
Direct-coupled Koepe winder at Snowdown Colliery



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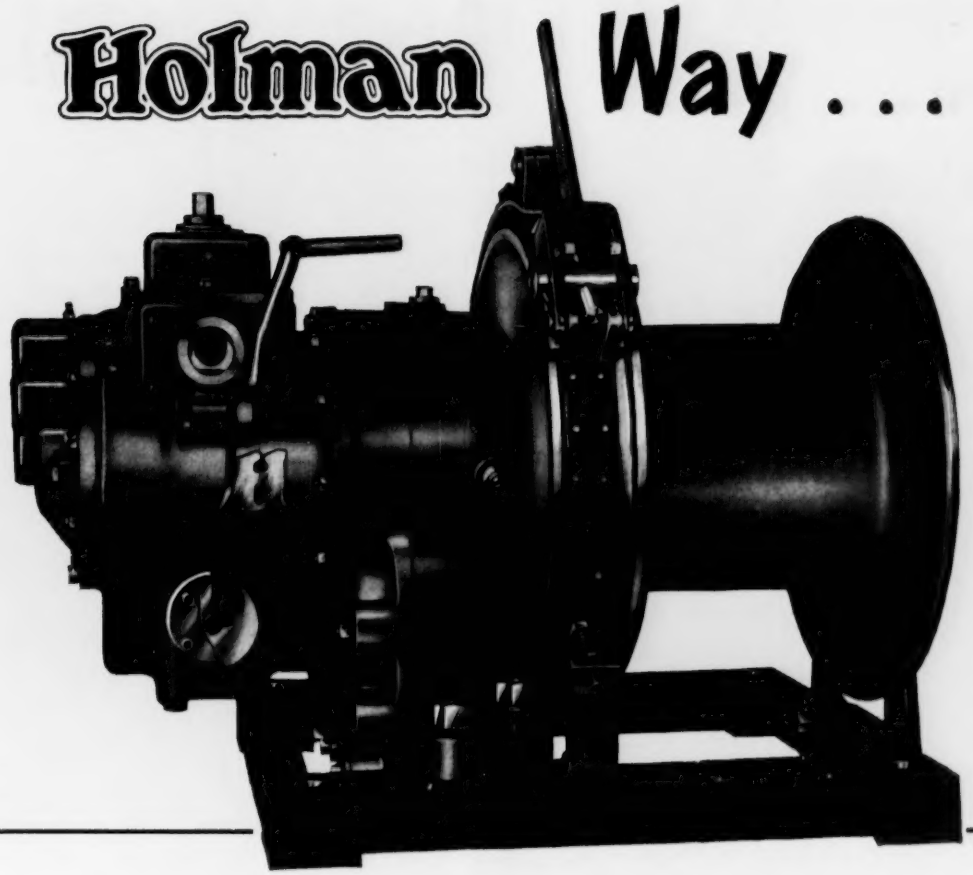

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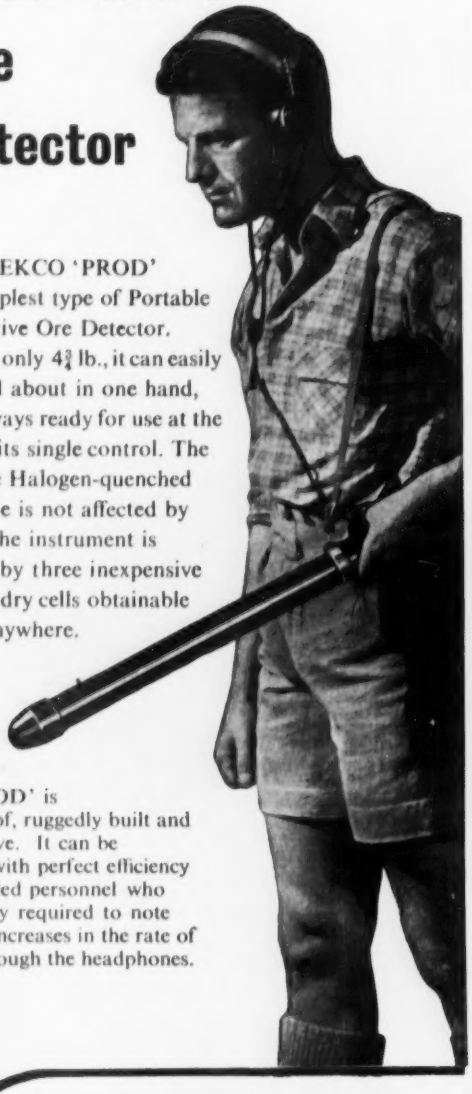

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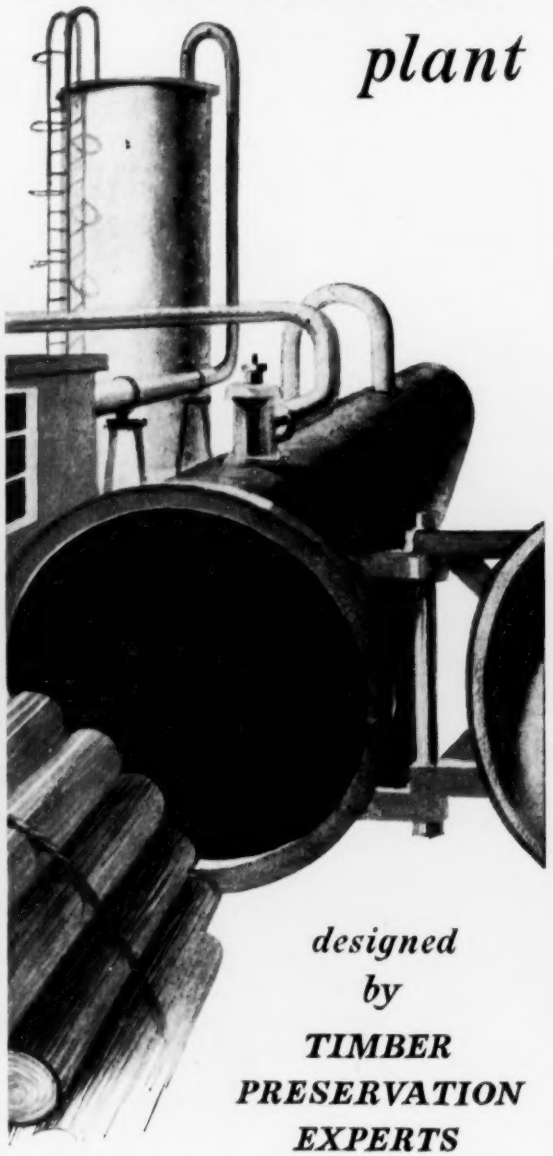

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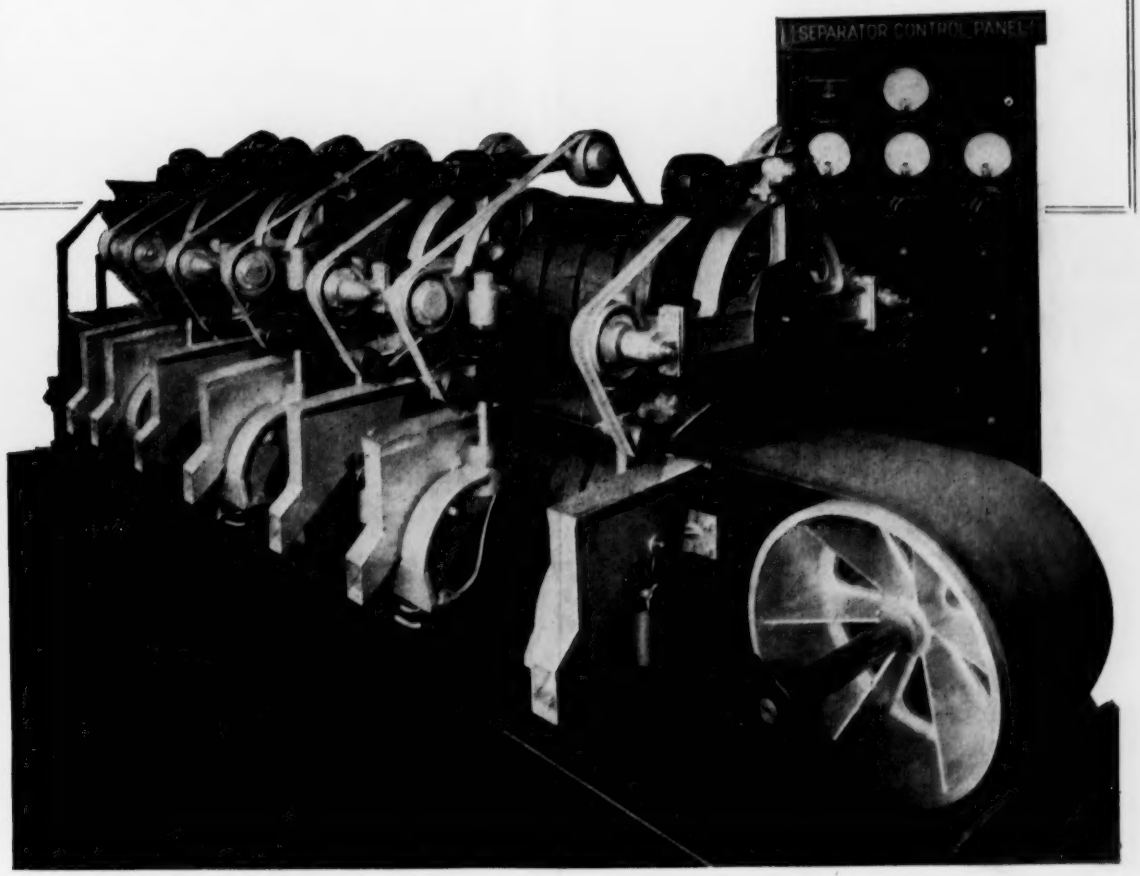

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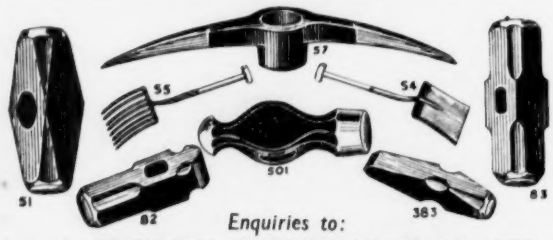

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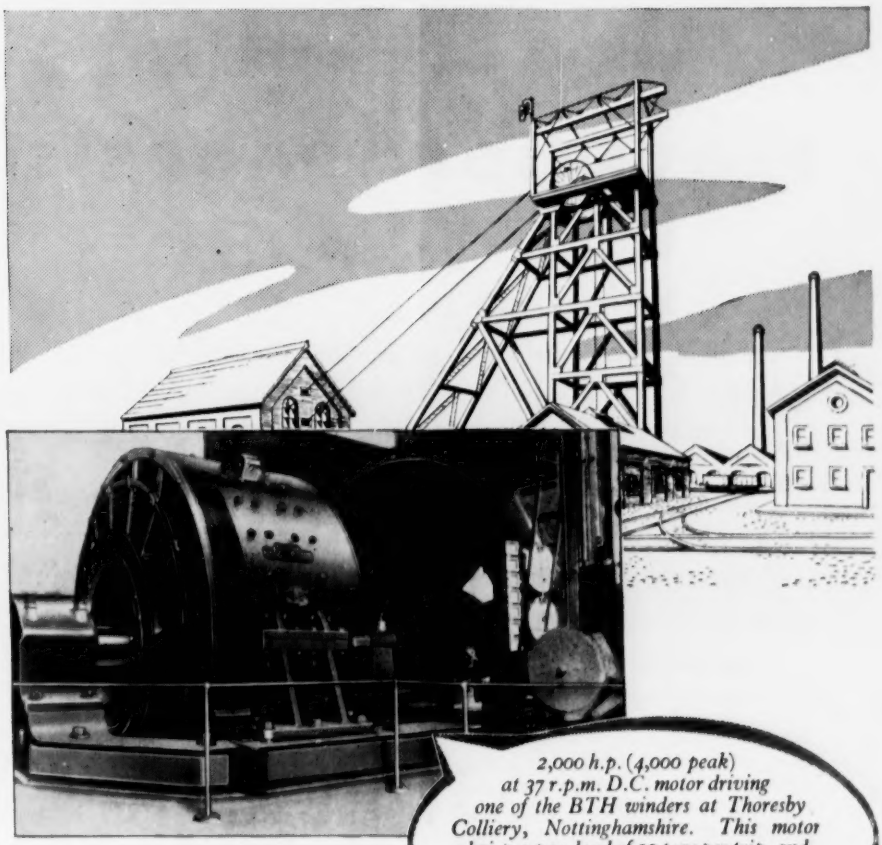

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Established 1835

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NOTES AND COMMENTS

Britain's New Power

"A Programme of Nuclear Power," the title of the White Paper published this week outlining the British Government's plans for the developmenet of atomic energy over the next ten years, was greeted with a sense of relief. The advent of nuclear power production some time in the near future had been generally expected. But in the absence of official statements as to the rate of progress, the imagination tended to boggle at many of the rumours circulating on what the impact on the country's economy could be when nuclear power production became a commercial reality.

The White Paper is necessarily a very general description of the lines of development along which this country's money, men, and machines will be channelled to effect the most efficient application on a commercial scale of nuclear fission as a source of heat to drive electric generating plant. The solid fact to consider in the next ten years is that work will be pushed ahead on plans to construct twelve nuclear power stations. Actual construction work on the first two of these stations will begin in 1957 and will be completed about 1961. The twelve nuclear power stations will provide a capacity of somewhere in the region of 1,500,000 to 2,000,000 kilowatts.

The impact of this nuclear power programme on Britain's coal mining industry in the short term will be negligible. Indeed, the White Paper makes it clear that nuclear power will act only as a supplementary source of energy to coal. By 1975, however, the nuclear power stations could represent a saving of some 40,000,000 tons of coal, which could make all the difference to the level of coal exports and thus to the U.K.'s balance of payments.

The repercussions on the uranium mining industry may prove to be more enduring. During the first ten years, at any rate, the programme will call for increased supplies of uranium at a time when no doubt other countries will be increasing their own commercial demands. After 1965 —the year in which the A.E.C.'s ten-year contracts with the South African uranium producers will begin to expire —work will be speeded up on the use of fast breeder reactors largely using thorium—although a small percentage of natural uranium would presumably be necessary to start the nuclear fire. The significance of fast breeder reactors is that by using thorium more nuclear fuel can be produced than is consumed.

That being so, the demand position for uranium in 15-20 years' time may be considerably easier. On this critical point the White Paper gives no guidance, but it must pose a real problem for the uranium producers in the future, and the sooner an explanation can be given of the possibly reduced—or even different—function, natural uranium will play in improved types of reactors for nuclear power production, the better for all concerned. Some information on this point may be forthcoming in the not too distant future from the experimental fast breeder reactor now being built at Dounreay, in Caithness, Scotland.

The potentially valuable overseas trade which can be built up by exporting the specific plant, equipment, and know-how, is also an extremely important point to bear in mind. In this connection, it would not be difficult to envisage the export of nuclear power plant to the Rhodesian Copperbelt as a practical alternative to the Federation's proposals to develop the Kariba and Kafue hydroelectric power projects. How feasible from an economic point of view this is can be seen from the estimate that the cost of producing electricity from the earlier stations in the programme has been computed at approximately 0.6d. per unit, which is about the same as the anticipated cost from the new coal-fired stations to be built during the same period.

Much more than that, of course, has been achieved by this major technological advance. For essentially it means that power becomes completely mobile and thus can be turned on like a tap in any area of the world clear of all the complications arising from climatic and geological conditions.

N.C.B. Reorganization

In a statement to the House of Commons on February 16 Mr. Geoffrey Lloyd, the Minister of Fuel and Power, revealed that the Government have accepted and promptly acted upon the recommendation of an advisory committee that the National Coal Board should be reorganized as a matter of urgency. This investigating committee, headed by Dr. A. Fleck, the chairman of I.C.I., has been engaged since 1953 at the Board's invitation in a searching investigation of the whole structure and functioning of the Board. Mr. Lloyd announced that four full-time members (including the two Deputy Chairmen) and two part-time members have been replaced. The reconstituted

board of twelve members is to take office next Monday, February 21. As yet there has been no official comment by the Board on the Report as indeed there could not be until such time as the Minister revealed his intentions about reorganization.

The findings of the Fleck committee reveal the thoroughness with which they have conducted the investigation and the Report makes 61 recommendations.

One of the major criticisms levelled at the existing organization of the industry is the lack of a clearly defined relationship between the various levels in the National structure. The Report stresses the importance, and existing lack, of effective control of the area by the division and the division by the Board. No change has been felt to be necessary in the general structure of the industry which should continue with the existing nine divisions and 51 areas retaining the line and staff system. There is a strong recommendation that the Board should insist on their policies being properly carried out by the subordinate formations and should ensure that discipline obtains. The findings indicate that the function of the divisional headquarters is not fully understood. The Fleck committee make the point that these Boards should not be regarded as being purely advisory. (Incredible though it may appear—this virtually has been the position.) The functional head of each level should be better qualified than his counterpart at the next level and his views should always be accepted unless there are compelling contrary reasons.

There are strong criticisms of the Board's concept of decentralization which has resulted in a lack of effective control of divisions and areas. Less autonomy for divisions is recommended and closer scrutiny by the Board of divisional schemes involving large capital outlay.

The power of the area general manager will be curtailed and the Report comments upon the fact that some existing A.G.M.'s do not measure up to the requirements of such a vitally important post. The Board is advised to take the earliest opportunity of appointing as area general managers some men who are not mining engineers.

At the colliery level, the committee found that a definite need exists for training courses for mine managers in administration and management, and they make the point that the manager has been taught to mine but not how to manage. Efficient administrative assistants should be appointed to mines to take over much of the administrative load from the manager.

Whilst acknowledging the undoubted progress made by the National Coal Board in the eight years of nationalization it is generally recognized that much remains to be done and implementing the recommendations of the Fleck Report may go a long way towards ensuring that it is done.

The committee says one of the greatest needs is for better management at all levels; more people of ability are required, new and better techniques for them to use and firmer discipline at all levels. One of the chief needs is for experienced higher grade officials. When the industry was nationalized most of the managing directors of the large undertakings did not choose to take up service with the Board, and thus the industry lost almost a complete level of experienced management at a time when it was most needed. This gap has not yet been filled.

Summing up one gets the impression that the need for such an investigation as has been carried out was not only justified but possibly overdue. It is to be hoped that the stricter control to be exercised by headquarters will be reflected in more resolute leadership throughout the organization

Mexico

(From Our Own Correspondent)

Taxco, January 21.

Production of zinc and copper in Mexico increased in the first nine months of 1954 over the corresponding period of the previous year, according to the weekly *Business Report*. At the same time output of the country's three other basic metals, namely gold, silver and lead, fell off. Outputs in September, 1954, were (in tons): zinc 188,348, copper 49,024, lead 178,094, silver 1,085 kilograms, and gold 10,258 kilograms. Production of gold, silver and lead has dropped considerably in general, and while production of zinc in 1954 was greater than in 1953, it was lower in comparison with 1952. Copper alone in 1954 showed a slight increase over the two preceding years. The report pointed out that, although only five principal metals were considered, a representative picture of the situation of the Mexican mining industry was nevertheless presented. The state of the international metals market was blamed for the decline in Mexican production.

EFFECT OF TAXATION

The truth is that the nation's ailing mining industry is unable to boost production levels due to lack of modern equipment and a dearth of the necessary capital for the exploitation of the ore reserves existing.

The Assistant Secretary of Economy, who has been fighting for the abolition of direct taxation of the mining industry as a relief measure, has predicted the exhaustion of those deposits now being worked "within a reasonable time." While admitting that the annulment of mine tax laws might temporarily upset the federal budget, he suggested that these losses would be amply recompensed through the creation of new sources of employment together with a revival of Mexico's leading industry through an influx of risk capital for exploration and the exploitation of new deposits.

A FIVE-POINT PROGRAMME

Two points of interest are that official feeling here is that the mines should be under Mexican ownership, although the hurdle of interesting Mexican capital in sufficient quantity has not been crossed as yet, and that the Secretary and Assistant Secretary of Economy see eye to eye on a broad five point programme designed to substantially aid the industry. The points included are: a vigorous expansion of mining reserves, a fiscal policy to stimulate mining activity, a programme of mining road construction, the development of a strong and truly Mexican mining industry, and safeguards for the national interest in mining policy.

The Department of Economy and Treasury are actively studying measures to bring this programme to reality. Although the proposed new mining law is being bitterly attacked by interests which would suffer from it—chiefly foreign-owned concessions—it is felt by the instigators that the five points listed would erase many difficulties.

There has been a move in the Mexican Congress to modify Article 27 of the Constitution to make it possible for the State to undertake mining operations. Creation of State mining, it is felt, would not infringe on private operations, and would be a real national force for the development of mineral reserves. A revision of the Constitution to make it possible for the State to have dominion over mineral riches of soil and subsoil would create national mining reserves and give the first real impetus to Mexican mining since the lush days of the colonial period.

Plastic Multiply Belting

By JOHN LEWIS

As a result of the too frequent coincidence of fires underground, it was realized in 1951 that some radical changes in the equipment used in the mines in the handling of coal were necessary. That pit disasters resulting from the spontaneous ignition of rubber conveyor belts—as had occurred at Creswell Colliery in 1950—as well as from other causes, had to be avoided at all costs was made clear in the report of the Chief Inspector of Mines. The ignition could readily occur if a belt became jammed and the driving drum continued to revolve so that enough heat could be generated by friction to cause the belt to burst into flames, while the appreciable air currents in the mine roadways made the spread of fire along the belt a rapid process. In turn, this fire could be the direct cause of explosion. The following article describes the steps taken by Rubber Improvement Ltd. to counter these hazards by the development of the non-inflammable multiply polyvinylchloride conveyor belt. The article describes the exhaustive tests which took place prior to and during construction of the new type of belt, while not the least interesting aspect is the special techniques of examination which were evolved in order to ensure a product which met all official safety requirements. The author, Mr. John Lewis, is Chairman and Director of Development of Rubber Improvement Ltd.

Natural rubber and cotton are both highly inflammable materials and it was soon realized by Rubber Improvement Ltd. that there was no practicable method of rendering these materials fire resistant in themselves without serious sacrifice of essential physical properties. As these were the basis of most of the conveyor belts employed in coal mines it was clear that some new thinking was required if satisfactory fire resistant multiply conveyor belting was to be developed.

It was established that the essential prerequisites of the new type of belting would have to be as follows :

(a) Complete lack of any tendency to propagate or support combustion, even under the most severe conditions ;
(b) The possibility of manufacture in the various sizes, types and ply construction, for which expensive conveying structures existed in the mines ;
(c) Possibility of manufacture in bulk from readily obtainable raw materials ;
(d) Longer service life to justify what seemed likely would result in a comparatively higher initial cost ; and
(e) Possibility of manufacture on a reasonable economic basis.

It was considered from the onset that plasticized P.V.C. had the most attractive possibilities as a binder for the textile plies which form the basis of heavy duty conveyor belting. Accordingly work was commenced on the formulation of a P.V.C. and plasticizer combination, which would form a bonding layer for the conventional cotton duck but which, at the same time, would effectively fireproof the duck under all conditions.

USE OF P.V.C.

It was clear that the most practicable way of coating the cotton duck was to start with a P.V.C. Polymer, plasticizer and stabilizer containing no solvents or diluent. Such a mixture, when subjected to heat treatment, sets to form a tough, resilient mass. By correct adjustment of the composition a wide range of properties can be imparted into the finished product.

At this time the prime object was to obtain maximum adhesion between the various plies which go to make a multiply conveyor belt, and the maximum toughness as measured by tensile strength tear resistance, modulus, etc. After some considerable preliminary laboratory work a sample length of P.V.C. belting fabricated from pre-coated cotton duck and covered on the face with calendered sheeting of a slightly harder and tougher composition than the plastisol bonding layers, was produced and submitted to the National Coal Board Research Laboratories at Stoke Orchard, Gloucestershire. The sample was subjected to test by this department and it was ascertained that even under most exacting conditions, there was no tendency for any ignition to occur, as the P.V.C. coating material had the effect of impregnating the cotton duck and thus prevented any glow.

This secondary point is very important as a glowing piece of charred cotton falling on to the underground roadway covered with coal dust is a serious hazard. It was for this reason that the earlier research work was based on a thermoplastic material rather than on a non-inflammable synthetic rubber such as neoprene, which is not thermoplastic after vulcanization and will thus offer no protection to the cotton duck.

PRODUCTION OF COMMERCIAL LENGTHS

After it was established that the production of a multiply non-inflammable structure reinforced by cotton duck showed promise, it was decided to extend this development still further and to produce a commercial length of belting. This presented a major problem because it involved the development of entirely new techniques, as although the completed P.V.C. conveyor belting is basically similar in construction to a natural rubber belt, the raw materials are very different in behaviour and require totally different processing methods. After several attempts, a usable length of 5 ply belting 26 in. wide based on 32 oz. cotton duck was produced. Initial tests on this limited quantity under actual service conditions were extremely encouraging and a decision was reached to produce on a considerably larger scale. By the middle of 1952, approximately 70,000 ft. of belting had been produced in various ply constructions, lengths and widths, and reports on the behaviour of these belts under a wide variety of operating service conditions were awaited, not without some degree of apprehension.

The performance of these first commercial quantities of P.V.C. belting was followed very closely by the N.C.B. and reports on behaviour under the various conditions were carefully examined. The test lengths included trunk, gate and face conveyors in most types of conveyor drives and structures.

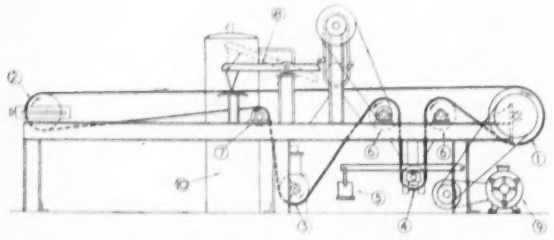
The earlier results were not all favourable, although it is fair to say that approximately 75 per cent of the belts were successful and a large number are still in work to-day after three years' service. The chief criticism of the earlier type of belting (S.P.77) was that it was considerably stiffer than the current types of rubber belting and thus slippage was encountered on driving drums of small diameters due to bad wrapping of the belt. Other troubles encountered were ply separation and some edge lifting, but by and large it was considered that the practicability of a conveyor belt impregnated and covered with plasticized P.V.C. had been established.

The stage had thus been reached when it had been proved to the satisfaction of the N.C.B. that it was possible to manufacture non-inflammable conveyor belting from indigenous materials having similar physical properties and identical

construction to the rubber belting, which, apart from its inherent fire hazards, had given excellent and long service.

A COMBINED FLEXING/CONCUSSION MACHINE

The problem still remained, however, of improving the undesirable characteristics, i.e. stiffness and lack of resilience, while at the same time it was essential that the excellent fire resistance, toughness and outstanding resistance to abrasion revealed in the original belting should be retained. To ensure this possibility, new testing techniques had to be evolved and chief among these was a combined flexing and concussion machine which was built by Rubber Improvement Ltd. to simulate, as nearly as possible, actual working conditions.



Schematic diagram of the belt testing machine. 1, driving pulley; 2, tail pulley; 3, brake pulley; 4, tensioning pulley; 5, tensioning weight; 6, guide pulley; 7, troughing pulley; 8, striking hammer and plate; 9, driving motor; 10, air receiver

In this machine a 40 ft. length of belting is continuously flexed around small diameter pulleys in both directions. Simultaneously, it is hammered against a heavy steel plate close to the underside of the moving belt. The hammer is so designed as to simulate large lumps of coal falling at a loading point. The pulleys are studded with hexagonal bolt heads and approximate to pieces of coal and stone being trapped by the belt in service.

The belt is not run idle but actually drives a compressor, which acts as a braking device and in fact the working tensions are calculated to be similar to those encountered by a normal belt running under full load. This test equipment provided valuable data, allowing the development work to proceed much more rapidly and enabled the necessary improvements to be carried out without the necessity of waiting for prolonged underground tests. It was soon clear that the new type of multiply P.V.C. belting which had been developed (S.P.79) no longer showed any signs of flexing, fatigue, and the resistance of the covers and edges to the heavy abuse encountered during the subsequent testing indicated that it was superior in many respects to rubber belting.

N.C.B. APPROVAL

After many months of testing underground, which involved approximately 10,000 ft. of this SP79 belting, full approval was eventually received from the National Coal Board in July, 1953. Since this date, hundreds of thousands of feet of Leonex SP79 belting have been produced and installed in the pits, and it is now an accepted standard product which, apart from its prime function of resistance to ignition in combustion, has been proved to possess physical properties which indicate that it has a longer life than rubber belting. It has also shown much greater resistance to attacks by mildew and is therefore of special importance in wet mines. Because of its greater durability, the higher initial cost is likely to be offset and the cost per ton of coal carried reduced. However, it is early to come to any conclusion on this point.

To achieve and maintain a high standard of productivity, it has been necessary to instigate a thorough system of checking of all the raw materials used for the construction of multiply plastic belting and thereafter carry out rigid tests on all completed belts prior to their being passed for dispatch. The system has been so organized that it has been possible to trace all materials used in any belt no matter when produced, and by means of statistics of this kind, it is possible to assess the merits of individual components and techniques which are constantly improving as more experience is gained. It is only by thus regarding and observing carefully these changes in comparison with actual performance that progress can be made.

Development work on new types and constructions of belting are always in progress and in fact a highly successful belt based upon Rayon fibre has fairly recently been marketed after lengthy tests in service of substantial quantities. This particular belt has the virtue of a very high tensile strength combined with minimum thickness and thus an increased flexibility. Other such developments will occur from time to time and all are aimed at increased efficiency and reducing costs, while maintaining the safer working conditions which have been considerably enhanced by the introduction of the non-inflammable multiply P.V.C. belt.

Coal in Eastern Europe

A more precise view of the coal mining industry in Eastern Europe than is customary was given in several papers presented at an annual conference arranged by the Eastern German Ministry of Heavy Industry and held at Freiberg during October last year. These papers were published in *Bergakademie*, a periodical published by the Freiberg Mining Academy.

Poland is the greatest coal producer in Eastern Europe. In 1954 91,000,000 tons of hard coal and 9,000,000 tons of oven coke were produced, an output which supplements the annual East German production of 4,000,000 tons of industrial coal, 1,000,000 tons hard coke and 3,800,000 tons brown coal. Czechoslovakia also receives about 4,000,000 tons of coal from Poland.

Coal production in the Soviet Union was estimated at 350,000,000 tons in 1954, showing a 30,000,000 ton rise over the 1953 figure of 320,000,000 tons. In 1940, the last pre-war year for which official figures are available, 166,000,000 tons of coal were produced, and it was reported that after the cessation of hostilities coal production was doubled in the Eastern basins in the vicinity of the Urals, with the result that pre-war production was restored by 1947.

The increased production recorded since the war corresponds to an annual rate of increase of approximately eight per cent, whereas a comparison of the outputs of Poland, Western Germany or the United Kingdom reveals annual increases varying from two per cent to four per cent. Some 70,000,000 tons of lignite are estimated to be included in the Soviet returns.

Production from opencast and drift mines is estimated to total 10.9 per cent of the total Russian coal output, and this percentage will be raised to 15.7 per cent in 1955. Mechanization of underground haulage systems, together with the use of cycle shiftwork, improved coal getting by 25 per cent at the face and by 40 per cent overall.

The acute problem in so far as Eastern Germany is concerned, after Poland and Czechoslovakia the third most highly industrialized state in Eastern Europe, is that of meeting growing energy requirements. The only major source of power is the large brown coal industry which produced 176,000,000 tons in 1953, equivalent to 53,000,000 tons of hard coal. The main problem is how to obtain a sufficiently large coke supply for the new steel and coke combine near Frankfurt-Oder, with a planned capacity of approximately 2,000,000 tons of steel per annum.

Developments in Natural Gas Transportation

By A. GRIERSON, B.Sc., A.M.I.Min.E.

A rapidly growing increase in the use of natural gas throughout the more industrialized areas of the world has stimulated the production of this fuel, and has promoted study of the most efficient methods of transportation from source to the consuming area. Natural gas is currently transported in a gaseous state by pipe line, but the possibilities of the bulk shipment of solid frozen gas are being tested in the United States, and in *The Mining Journal* of October 29, 1954, reference was made to the considerable attention given to the conception of shipping liquified methane by refrigerated tanker. The following article discusses these methods of transportation and indicates that their potential value is obvious when it is realized that an estimated minimum of 1,000,000,000 cu. ft. per day is wasted in the Middle East alone through lack of any economic outlet.

The collection of natural gas has developed into one of man's major industries. As is well known, natural gas occurs chiefly in association with crude petroleum but is sometimes found in independent deposits. Although composition varies widely according to source the gas mostly comprises the simple and normally gaseous paraffin hydrocarbons. A typical analysis of natural gas expressed in terms of volumetric percentages is: methane 70, ethane 15, propane 7, and butane 5. There may also be slight amounts of nitrogen and carbon dioxide present as impurities.

NATURAL GAS IN NORTH AMERICA

The last decade has seen a phenomenal increase in the use of natural gas in those industrial centres situated near oil fields, particularly in North America. Sales of the U.S. natural gas industry—now the sixth largest industry in the U.S.A.—are increasing extremely rapidly and production is currently running at some 20,000,000,000 cu. ft. per day. The increase in the use of natural gas has not been confined to industry although industrial consumption does, of course, constitute the major demand for gas. However, the number of homes in the U.S. using natural gas is estimated at almost 20,000,000 and this figure is expected to increase to 24,000,000 by 1957. Latest available figures indicate that natural gas supplies almost 30 per cent of all the energy requirements of the U.S.A.

To keep pace with growing demand, the American natural gas industry is spending $3,500,000,000 over the four year period ending in 1957, roughly half of which will be invested in trunk pipe-line facilities. The piping of natural gas from the well to the consumer is normally a cheaper means of transport than the hauling of solid or liquid fuel of equivalent heat value and the technique of long distance pipe-line transmission is now so developed as to make transcontinental pipe-lines an economic possibility. Work is expected to begin shortly on the $350,000,000 Trans-Canada Gas Line. This line, when completed, will be 2,247 miles in length and will utilize pipes ranging from 14 to 30 in. in dia. The pipe-line will link up Alberta, Toronto and Montreal and it is hoped that permission will be given to the Northern National Gas Company enabling them to import Canadian natural gas into the U.S.A. through a branch line from the main pipe.

Canada is already exporting natural gas into the U.S. although on a comparatively small scale. One installation is the 56 mile pipe-line from the Pakowki field near Lethbridge which carries gas to Butte, Montana. It is expected that almost 45,000,000,000 cu. ft. of gas will be piped during a four year period ending next year. The gas reserves of Canada are immense, and as fresh finds are made, continue to increase.

Over forty large-scale pipe-line installations are contemplated in North America and these will supplement the existing major networks. Needless to say North America is not alone in exploiting natural gas resources, and extensive developments are being made in a great many countries.

The proposed Sui-Karachi Gas Line, shortly to be completed, is a project which will materially contribute to the industrial development of West Pakistan. This £9,000,000 system will connect the Sui field in Baluchistan to Karachi —a distance of 350 miles. Initially the 16 in. line will carry some 33,000,000 cu. ft. of gas per day, this being equivalent to 500,000 tons of imported coal per year. By 1965 the demand is expected to be 100,000,000 cu. ft. per day and at this rate of production the Sui field has an estimated life of 60 years or so. Even at the initial low rate of production Sui gas can be delivered to Karachi more cheaply per heat unit than any other competitive fuel and when maximum production is reached the saving will be commensurately greater. Six wells have now be completed at Sui and each has revealed a steady potential production of 10,000,000 cu. ft. of natural gas per day.

In Europe, a country on which the discovery of natural gas has had a marked effect, is Italy. Sales of natural gas to domestic consumers in Northern Italy which were very small until recently have now reached 8,000,000,000 cu. ft. per year and are likely to go on increasing.

SUPPLY IN EUROPE

In Hungary, gas engineers have found and tapped a new deposit of natural gas estimated to be at least 35,000,000,000 cu. ft. This deposit of almost pure methane is lying in many small pockets. Although by some standards the volume of gas is small, the find has nevertheless proved very opportune in that the gas will provide a means of augmenting the winter supply of coal gas to Budapest. The natural gas has been tapped at Csomad and the immediate intention is to draw the gas off into railway containers and haul these to Ujpest, a Budapest suburb. From here the gas will be piped across the Danube to the coal gas works supplying Budapest where the methane will be blended with the manufactured gas in the proportion of one to three. With gas of high calorific value such blending may be necessary to enable existing domestic gas appliances to be used; these being usually set for use with manufactured coal gas having a much lower C.V.

Ultimately a pipe-line is to be constructed which will carry the gas the entire 18 miles from Csomad to Budapest and an interesting feature of this installation is that this pipe-line will be used during the summer months to carry gas in the reverse direction, i.e., from Budapest to Csomad. In winter months it has been difficult to meet Budapest's daily needs of 30,000,000 cu. ft. but in the summer the city gas works can produce a surplus of manufactured gas. This surplus will be piped back through the pipe-line into the wells at Csomad that have been emptied of methane thus using them as reservoirs in which the coal gas can be stored until the heavier demands of winter.

The system of using emptied wells as storage tanks is finding increasing favour in many parts of the world. Apart from the obvious advantage of eliminating the need for costly surface tanks it is stated that leakage is reduced and in addition insurance charges are less.

In Britain an energetic search for natural gas is being conducted both by the nationalized gas undertaking and also by private combines. The Gas Council, faced with rising fuel

costs and diminishing supplies of good carbonizing coal, is spending £1,000,000 over a period of five years prospecting for gas. This search has met with little success to date but many authorities are emphatic in asserting that appreciable natural gas reserves do exist in the U.K.

A limited amount of methane has been obtained from long distance boreholes in coal and associated strata. However, this operation has as its principal objective the removal of the gas to increase the safety of the miner, and the subsequent economic exploitation of the methane is purely secondary and is insignificant from a national standpoint.

It is to the Middle East that Western Europe must turn for significant developments in the natural gas sphere. Although the Middle East supplies a large part of the world's fuel oil needs much of the associated natural gas of this area is going to waste through the flare stacks. It has been estimated that a minimum of something like 1,000,000,000 cu. ft. of natural gas is daily running to waste for want of an economic outlet.

THE BECHTEL PLAN

In 1951 the Iraq Government requested the International Bank for Reconstruction and Development in Washington to undertake a comprehensive survey of indigenous resources and of the potentialities of their economic exploitation. Following the report of this body the Bechtel International Corporation came forward with tentative proposals for a scheme of far reaching implications. This project involved the construction of an immense pipe-line system through which natural gas from the Middle East would be carried to the industrial centres of South and West Europe as far as Paris and possibly across the English Channel to the U.K.

The main pipe-line as envisaged in the Bechtel plan would run from Kirkuk in Northern Iraq, through Turkey and then under the Bosphorus to Greece. From here the pipeline would extend to Austria via Italy or Yugoslavia and thence on to South West Germany and the North of France. Branch lines would serve Bulgaria, Hungary, Czechoslovakia, Switzerland, Belgium, Holland and the U.K. The magnitude and scope of this plan dwarfs any industrial project ever undertaken and if carried through would make natural gas from the Middle East available to some 15 countries with a population in excess of 300,000,000.

The plan provides for a main 2,500 mile pipe-line (exclusive of branch lines) capable of carrying 500,000,000 cu. ft. daily. This flow of gas is equivalent to 6,000,000 tons of coal per annum and even this figure represents only a part of the heat energy at present wasted in the Middle East.

Bechtel's preliminary estimates of the capital investment required to put the scheme into operation was $425,000,000 with running costs (including amortization) in the region of $34,000,000 per annum. On the basis of these estimates natural gas could be delivered in Paris at less than one quarter of the cost of city manufactured coal gas. This cost comparison is on a purely volumetric basis, i.e., in terms of cost per 1,000 cu. ft. of gas. Bearing in mind that natural gas has a calorific value almost double that of average manufactured town gas, it will be apparent that from the standpoint of equivalent heat units the natural gas from Iraq would be available at about one-eighth of the cost of manufactured gas. If only the technical and commercial aspects of the project needed to be considered it seems that here is a means of filling the gap between Europe's fuel supply and demand. Unfortunately an international project of this kind is inevitably bound up with political problems and it is perhaps significant that this far-sighted scheme has not progressed much beyond the drawing board and slide rule stage.

The formidable political problems inherent to the crossing of numerous frontiers militates against a land scheme such as Bechtel envisaged—but what of a scheme linking the Middle East and Europe by sea?

The possibility of long distance transportation of natural gas by water is currently being put to the test in the U.S.A. This concept of bulk shipment of frozen natural gas originated from Mr. W. L. Morrison and associates of Chicago. The basic principle underlying the method of freezing and storing the gas is to some extent akin to that applied to storing and transporting the liquefield petroleum gases butane and propane, in that the operation is brought about in order to reduce the volume of the fuel. The essential difference between liquefaction of petroleum gases and natural gas is that the former are liquefied by pressure and kept in this state by storage in pressurized containers whilst natural gas is made liquid purely by deep freezing. This refrigeration is taken down to minus 260 deg. F. and effects a reduction of the gas to one-six hundredth of its original volume. The gas is maintained in liquid form at atmospheric pressure in heavily insulated containers. These tanks are lined with one foot thick layers of balsa wood and thus the gas is kept in deep freeze during shipment. Many tens of millions of cu. ft. of gaseous fuel can thus be liquefied and carried in a single ship to any part of the world.

BENEFITS OF FROZEN GAS

This method of transporting natural gas is not so prone to political objections as a land scheme. The system affords greater flexibility both from the point of view of supply and demand and also when considering the geographical location of the terminal ports. The original American scheme provides for the equipping of eight barges with insulated tanks, each barge having five storage tanks with a total capacity of approximately 35,000 bbl. These vessels will carry frozen natural gas from the Gulf area up the Mississippi and Illinois rivers to Chicago. This involves a haul of roughly 1,000 miles. The following figures suggested by Dr. J. F. Foster of Battelle Memorial Institute, Ohio, give some indication of the economics of the project. They are based on the assumption that 20,000,000 cu. ft. of natural gas will be liquefied daily and refer to the cost in cents per 1,000 cu. ft. of gas :

At well	*Gathering*	*Liquefaction/ Storage*	*Transportation**	*Total*
6	2	20	10	38

* From the Gulf to the East Coast.

The outcome of the venture is eagerly awaited and meanwhile the possibilities of extending water borne shipments of natural gas from river to ocean transport are already being considered by experts from many countries. A technical mission from the U.K. recently went to America to study the scope for extending the Morrison scheme to tanker transportation of Middle East gas to Britain.

It is interesting to summarize the findings of the U.S. Foreign Operation Administration report on the possible uses of waste natural gases in Saudi Arabia. This F.O.A. report indicates that some 600,000,000 cu. ft. of natural gas is daily being produced. About half of this is utilized by the oil company itself, chiefly in the gas injection plant at the Abqaiq field which injects 150-180,000,000 cu. ft. per day into the reservoir to maintain pressure. The remaining 300,000,000 C.F.D. is going to waste and the report indicates the need for bulk exportation by sea to European markets.

The economic aspects of such a project are based on the assumption that 500,000,000 cu. ft. of natural gas would

daily be available in Saudi Arabia. Of this total 100,000,000 cu. ft. would be needed to operate the freezing plant and as fuel for the ocean-going tankers. To handle the remaining 400,000,000 cu. ft. of natural gas per day the report states that 20 special tankers of 15,000 tons net would be required. These would cost about $9,000,000 per vessel and together with the liquefaction plant and terminal facilities, etc., the total estimated cost is $350,000,000. Running costs are anticipated as being $40,000,000 per year and using these figures the estimated cost of the gas at, say, tanker terminal London, works out at 43 c. per 1,000 cu. ft. The report suggests that the market value of the product for wholesale distribution within the U.K. would be in the region of 60 c. per 1,000 cu. ft. Assuming a calorific value of 1,000 B.Th.U.'s per cu. ft. of natural gas, the cost per therm to the British consumer would thus be rather less than sixpence. This is approximately one-third of the current cost to the consumer of London manufactured coal gas.

Apart from the undoubted advantages to the consumer, large-scale importation of natural gas would have a marked effect upon the national economies of the countries involved and would radically change the energy picture in Europe and elsewhere.

The F.O.A. report fully confirmed the technical and commercial feasibility of the Bechtel pipe-line project. Indeed, even after allowing for an increase of 20 per cent over the original 1951 estimates of cost the report indicates that piped gas could be supplied in Europe at less cost than frozen gas. However, the prospects for an international gas line in Europe are not too bright and the shipping of frozen gas across the seas appears to be more imminent.

DIAMOND DRILLING—II

Recent Progress in Diamond Drilling Practice in the U.S. and N. Rhodesia

By R. G. WEAVIND and R. M. FERGUSON

Marked developments in the use of diamond drills for pillar recovery and stoping operations have taken place in Northern Rhodesia, while at the same time widespread testing has provided interesting data on the efficiency of various types of diamonds, designs of crowns and on the effects of vibration on crown life. The following article, the concluding instalment of two, describes these developments in diamond drilling practice in Northern Rhodesia and in the United States. The authors are respectively joint director of research at the Diamond Research Laboratory, Johannesburg, and director of Boart Products Ltd.

In the United States of America there has not been much basic change in diamond drill machine design over the past ten years. There are, however, some noteworthy operating improvements. These include a fluid coupling between motor and transmission, means of substituting one type of power for another with emphasis on diesel power, and means of increasing braking capacity and bit speed in shallow holes. In deep hole drilling, that is holes in excess of 3,000 ft., greatly improved drilling equipment is available.[1]

DRILLING EQUIPMENT IN THE U.S.

Briefly, the equipment consists of a Kelly type drive, hydraulic feed, and separate hoisting unit. The Kelly may be rotated by a conventional diamond drill unit, or preferably by a unit of entirely new design. The unit is manufactured by one of the leading firms in America and consists of a high speed rotary table (200-800 r.p.m.) powered by a 50 h.p. diesel or similar engine. The power is transmitted via clutch, and gear drive or, if desired, a fluid coupling can be provided.

Recent holes have been drilled with a 75 ft. derrick permitting 60 ft. pulls; a separate hoist handles rods in and out of the hole. Current practice is to use "U" series drill rods and core barrels varying in length from 20 ft. to 60 ft. It is claimed that with the above unit the net drilling time per shift worked can be increased, an important factor when labour costs are high.[1]

The deepest hole drilled with diamond bits in the United States of America was a BX hole 6,010 ft. deep. The hole was inclined at 80 deg. to the horizontal. Special equipment was used to accomplish this.[1]

In drilling deep holes, the use of mud is replacing water, and increased core recovery is claimed. Deflection of holes is accomplished by means of retractable deflecting wedges. It is claimed that these are an advantage as there is no possibility of loosening as was the case with non-retractable wedges.[1]

A special cement injector has been developed for cementing at depths greater than 2,000 ft. It consists of a cylinder sealed at the bottom with a sheet of thin brass and containing a free moving piston. This assembly, filled with cement, is attached to the drill rods and lowered into the hole. When the injector reaches the bottom of the hole, pump pressure is applied to the rods causing the disc to break and the piston to eject the cement. The injector has been found to work satisfactorily to a depth of 4,500 ft.[1]

The diamond bits and shells used in the United States of America have been developed after much experimentation. Modern practice is to use a powdered metal matrix with a hardness classification into three divisions: (a) standard (30 Rockwell C), (b) hard (40 Rockwell C), and (c) extra hard (50 to 60 Rockwell C).

The size and design of the waterways in the crowns are constantly modified to meet changing conditions. The diamonds used in the bits vary from 5 per carat to 150 per carat; the harder the ground, the smaller the stone is the usual criterion in size. For fragmented ground, diamond impregnated bits are finding increased application. The diamonds are set in powder metal matrices in this type.

BLAST HOLE DRILLING ON THE COPPERBELT

Probably the greatest developments in blast hole drilling have taken place in the Northern Rhodesian copper mines. First developed at Noranda in Canada, diamond drilling was studied and adopted for the purpose of recovering pillars at Nkana in 1939. Subsequently, the use of diamond drills was extended to stoping and caving the hanging wall and by the end of 1949 virtually the whole production of the Nkana and Mindola mines was obtained by this method of stoping.[2]

The drilling machines used have evolved from hand-fed air-powered drills to machines fitted with automatic screw feed and a set of variable feed gears to prevent stalling. The vane motors are giving way to piston engines with greater power. The new drilling machines are fitted with a high speed reverse gear to prevent loss of time when re-

turning the crown to the face after coupling the new section of rod.

Originally, EX holes were drilled, and this has now given way to the larger BX, in some cases NX holes are drilled. With the increase in hole diameter greater power has been required. The earlier machines developed 5-7 h.p. at 80 lb./sq. in. air pressure, and latest machines are of the order of 15-18 h.p. This has led to increased air consumption, and in this connection hydraulic powered machines are being investigated. One of the hydraulic machines is capable of an output of 25 h.p. and a worn BX non-coring bit has been driven at a penetration speed of 10 in./min. with this machine—nearly double the normal speed of drilling.

BLAST HOLE DRILLING CROWNS

The crowns used by the Rhokana Corporation for blast hole drilling are made up from Congo cast setting material and the size and number of stones in the crowns is shown in the following table.

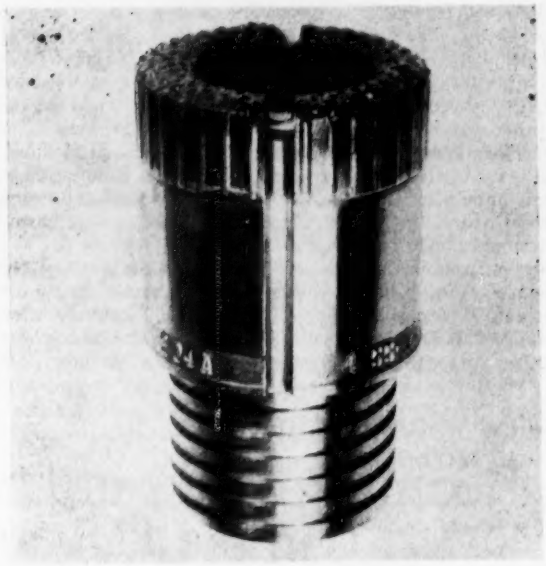
	EX	*BX*	*NX/BX Reamer*
Number of stones	175	330	565
Carats	16	27	51

Smaller stones have been used with encouraging results. It is claimed that although there was no improvement in footage, the decreased diamond losses showed the possibility of cheaper drilling.[3]

Lately, further tests have been undertaken with crowns set with other types of diamonds. Although almost double the cost these stones are giving satisfactory footages. It is, however, too early to judge whether these diamonds will replace the Congo variety.

The design of the crown profile has been the subject of much investigation and has resulted in the adoption of a concave face of conical form, the cone having an included angle of 125 deg., the shoulders of the crown being rounded. A single water hole 15/32 in. dia. is provided, but there is some evidence that two 5/16 in. water holes on opposite sides of the centre would be preferable, and it is felt that sludging would be improved by this arrangement. "Semi-coring" crowns having a $\frac{1}{4}$ in. hole in the centre of the crown face have been tried but without success,[5] although on another mine in the Copperbelt this type of crown is being used with success in different rock formations.

EX non-coring crown



EX coring crown

Considerable advances in diamond drilling have been made by improving ancillary equipment, such as the drill rods. These are now made to the "B" specification and the Acme taper thread is used in place of the couplings. Much time is saved coupling and uncoupling rods fitted with this thread.

EFFECT OF VIBRATION

Experiments carried out in the Nkana mine test chamber indicated that vibration had a marked effect on crown life.[6] The vibration set up by the flexing of the rods in the hole caused the crowns to chatter against the face with consequent damage depending on the amount of vibration. To overcome vibration, rod greasing was resorted to and as this had to be done every 10 ft. considerable loss of drilling time resulted. By the adoption of the improved rod and the fitting of a stabilizer every 10 ft., the need for greasing has been largely overcome and vibration has been greatly reduced. The footage drilled per machine shift has increased from 40 to over 70 on the machines fitted with these improvements.

The stabilizer consists of a coupling which has been set with three 1 in. long tungsten carbide inserts placed equidistantly around the periphery and at an angle of 45 deg. with a right hand lead. The diameter across the inserts is two 5/16 in. just less than that of the crown. With the attachment, holes up to 60 ft. are being drilled without grease.[6]

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Machinery and Equipment

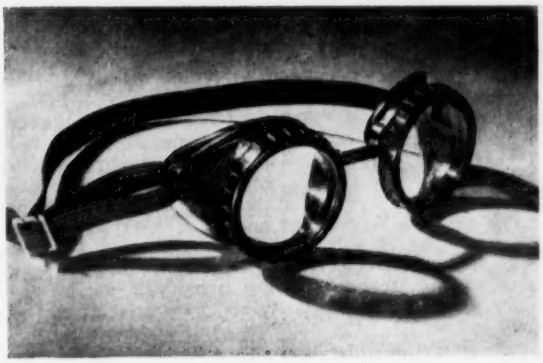
Cast Iron Conveyor Pulleys

The standard cast iron conveyor pulleys manufactured by Crofts (Engineers) Ltd. are designed for medium and heavy duties. They are available in single and double arm or plate centre construction, dependent on the belt width, and as taper (convex) faced or flat faced pulleys. Controlled manufacturing methods ensure the concentricity of the boss with the pulley rim, the thicknesses of which are commensurate with the class of duty. Pulleys are precision machined overall and balanced for true running, the result being apparent in the long belt life obtained. Bosses, which can be of either the solid or split type, are supplied, bored and faced.

The pulleys are made in a standard range of diameters from 12 in. to 60 in. with face widths varying from 16 in. to 64 in., to cover the majority of industrial requirements. These pulleys can be visualized as fulfilling a role in certain applications within the mining industry.

Eye Protection in Mines and Quarries

Greater comfort, and therefore increased operating efficiency, has been achieved by Safety Products Ltd. in the manufacture of their Pulsafe Model PCF-1 nylon contour mould plastic grinder goggle.



The PCF-1 plastic grinder goggle

The contour-fitting eye cups are designed so that only the smooth rolled edges make contact with the face, as the eye orbits are safety sealed, and it is interesting to know that the goggle can be supplied with the same ventilation fitments as the baffle port goggle designed for use in dusty atmospheres. The grinder goggle therefore has applications in the mining industry, both underground and opencast, and in quarries. The eye cups are unaffected by sterilization, and the weight of the complete goggle (glazed) is 2¼ oz. The goggle is equipped with a standard 2 in. dia. lens.

Other goggles produced by the same manufacturers are the Pulsafe PCW-1, a contour mould plastic welder goggle, weighing 3 oz. glazed and with 2 in. dia. lens, and the Pulsafe PBS-1 "Tough-Spec" for industrial applications.

International Machine Tool Exhibition, London, 1956

The next International Machine Tool Exhibition to be organized by The Machine Tool Trades Association will be held in 1956 from June 15 to June 29 inclusive at Olympia, London.

It will be the major machine tool exhibition of the year as, following an understanding with the European Committee for the Co-operation of the Machine Tool Industries, no other international machine tool exhibition will be held in Europe during 1956.

Technical Briefs

Oxygen in Direct Ore Reduction Process

The production of pig direct from fine ores without the necessity of wasting heat in obtaining nodules is the principle feature of a process recently developed by Frank G. Parker and Co., United States, according to a report in *Steel*. The method was devised primarily for operation in Venezuela to reduce the fine ores obtained from screening operations and from ore deposits in that country, with the inexpensive natural gas that is available. The process also can be applied in plants where coke oven gas is available, or in other areas where ore must be pulverized for beneficiation.

In operation the ore passes from a suitable bunker into the ore dryer and is conveyed to a dry ore bunker of sufficient size and capacity for at least a two-hour run, through a special feeder to the pulverizer. Ore from the pulverizer is transported by air to a reduction furnace and reduced to iron. This is fed to the hot metal furnace at approximately 1,600 deg. F. The fuels used are either natural gas, coke oven gas, or a high Btu regenerative gas manufactured from bunker "C" fuel oil. The latter type gas, produced in a regenerative reverse flow unit, will have a heating value of 1,000 Btu per cu. ft.

Waste gas is used for all reheating purposes, for the transfer of fine ores in the recycling circuit, for drying, for the production of power and steam, and to produce hydrogen required to reduce the ore to iron in the reduction furnace. High-purity oxygen is essential to maintain the necesssary temperatures in the hot metal furnace.

The process also is applicable for the reduction of pyrites, coal brasses and other sulphite ores. This method of using oxygen for handling and reducing fine iron ores without wasting heat, is economical and applicable to fine ores in locations which offer a supply of natural gas, coke oven gas, or a high Btu regenerative gas made from bunker "C" fuel oil.

A Superior Type of Gold Plating

Fedot'ev and co-workers have recently investigated the effect of factors such as composition of the electrolytic bath, temperature and current density on the microhardness and resistance to wear of gold plate. It was found that adding 2 g./l. of nickel to a bath containing 4 g./l. of gold, and depositing with a cathode density of 2 amp./sq. dm., the hardness, as compared with a pure gold plate, was increased 1.6 times. The deposit was smooth and the colour was good.

A further increase in nickel content of the bath gave a further increase in hardness but there was a deterioration in the colour. A decrease in temperature also raised the hardness but again the colour was poorer. The presence of nickel lowered the hydrogen evolution potential, so permitting the use of a higher current density.

It was found that best results were obtained with a bath containing 4 g./l. of gold, 2 g./l. of nickel and 16 g./l. of free KCN. Platinum anodes were used and the cell was operated with a cathode current density of 2 amp./sq. dm. at 70 deg. C.

Influence of Temperature on Grinding

The influence of temperature on grinding efficiency has been the subject of an investigation by L. E. Djingheuzian (Trans. Can. Inst. Min. Met. 57, 1954). Seven sets of experiments were carried out using copper-nickel ore, oölitic limestone, two silver-lead-zinc ores, Flin Flon ore and quartz. The experiments were carried out in a ball mill 8 in. long and 7½ in. in dia. running at 72 r.p.m. The mill charge was 1 kg. of ore, 750 ml. water and 20 lb. of forged steel balls between ¾ in. and 1 in. dia.

It was found that there was an increase in mechanical efficiency with an increase in temperature during grinding. For a given temperature, with other conditions remaining constant, grinding efficiency was found to be a function of the size of the feed. For a given feed and a fixed temperature, there was a fixed time of contact at which grinding efficiency is at its maximum.

METALS, MINERALS AND ALLOYS

COPPER.—In their recently published annual review of the base metals, the British Metal Corporation gives a preliminary estimate of world mine production of copper in 1954 at 2,750,000 l.tons (including an allowance of 300,000 tons for the U.S.S.R.). Although this figure is virtually unchanged from 1953 there are significant variations in the performance of the individual countries. Thus U.S. production is shown at 740,000 tons (against 826,000), due partly to the American producers' curtailment of output during the early months, and partly to the strikes of August to October. Against this, Canadian output is shown to have recorded a big increase at 270,000 tons (225,000), and the Copperbelt a lesser increase at 395,000 (367,000).

Looking ahead, the B.M.C. review foresees the possibility that world mine production *could* reach 3,000,000 tons this year, given reasonable freedom from stoppages. This estimate allows for an increase in U.S. production to 900,000 tons (as the outcome of the coming into production of various mines on price support contracts) and also envisages the possibility that Chile could increase production this year by 90,000 tons. This no doubt is dependent on a satisfactory outcome to the tax reform negotiations. Such an increase would restore Chile, at any rate temporarily, to her position as the world's second largest producer, as in any case it appears unlikely, bearing in mind the fuel position and the odd 40,000 tons production already lost on the Copperbelt this year, that Rhodesian production will be much in excess of last year's figure.

Strike news from the Copperbelt is of a gradual continuation of the drift back to work. On Tuesday last it was claimed by the Chamber of Mines that production was up to 62 per cent of normal with 9,567 Africans at work. The Chamber of Mines is also reported to have issued a statement to the effect that the companies were actively engaging new recruits for the mines, the implication being that if this trend grew to any considerable proportions, it would lead to the eviction from their houses of some of the strikers. The strike leaders announced over the weekend that Mr. Ronald Williams, the British M.P., who is legal adviser to the National Union of Mineworkers and was a member of the Guillebaud tribunal, would shortly be visiting the Copperbelt in order to advise the African Mineworkers' Union over their pay dispute.

Meanwhile the European Mineworkers' Union is calling branch metings throughout the Copperbelt to ensure that delegates on the General Council carry the full mandate of individual union members when the Council meets on March 7 to consider how African advancement is to be implemented with suitable safeguards to the European miner.

We give below our summary of the latest Copper Institute figures of refined production and stocks.

	Production			*Stocks*		
	Jan. 1955	*Jan.* 1954	*Jan.-Dec.* 1954	*Jan.* 31 1955	*Dec.* 31 1954	*Jan.* 31 1954
U.S.A.	123,840	111,869	1,311,249	45,982	47,108	108,187
Other countries*	85,590	85,100	1,155,028	159,283	181,529	280,510
World	209,430	196,969	2,466,277	205,265	228,637	388,697

* Excluding U.S.S.R., Japan, Australia, Norway, Sweden and Yugoslavia.

One of the sources of increased copper production, next year if not this, promises to be the development by Anaconda by two small properties in Chile—the Africana and the La Aguirre mines, which are located about 8 to 10 miles from Santiago. A recent *Reuter* dispatch from Santiago suggests that production at the Africana mine may start within the next two months and will eventually account for 20,000 tons of concentrates per annum.

Following the United States' decision last week temporarily to ban exports of domestic refined copper and to limit exports of scrap, Canada decided this week to ban all scrap exports for the time being. Ottawa, however, is placing no embargo on exports of new copper although it is pointed out that in fact most of the current production is already allocated.

Contrary to expectations, the U.S. price of copper scrap continued to rise after last week's export ban and some fabricators have been paying as much as 3 c. premium over a nominal price of 30 c. This they will have to get refined on toll representing a final cost of perhaps 37 c. Washington is reported so far to have refused requests to divert nearby stockpile deliveries to industry, despite the electrical industry having submitted estimates showing that there is likely to be a shortage of 15,000 tons of copper compared with March bookings or alternatively 11,000 tons merely to maintain the 1954 level of production.

LEAD.—British Metal Corporation estimates lead production in 1954 coupled with a recent review of the industry in the States from the Bureau of Mines together provide a first statistical picture of the past year. Preliminary estimates of world mine production suggest a total of 1,862,000 l.tons (including 190,000 in the U.S.S.R.). U.S. production has again declined to 283,000 l.tons (the smallest total for twenty years) while production in the rest of the world has risen by approximately 100,000 tons to which Australia contributed an additional 25,000 and Russia an additional 20,000, the remainder of the increase being spread fairly evenly over the other producing countries.

The B.M.C. estimates consumption of newly mined lead outside the States at about 1,200,000 tons (1,000,000 in 1953) leaving a surplus for absorption by the U.S. of 400,000 (against 500,000). In fact U.S. imports totalled 395,000 tons according to the Bureau of Mines, a figure pretty close to the average for the past seven years, compared with pre-war years when the American consumer was virtually independent of foreign supplies. This fundamental change in America's post-war lead position underlines her dependence on overseas supplies and makes nonsense of current attempts in Congress to restrict imports.

Within the States in addition to domestic mine production and imports which together totalled 678,000 tons, secondary lead accounted for a further 429,000 making a total of about 1,100,000; against this consumption accounted for 975,000 tons. As exports were virtually nil and stocks up by not more than 20,000 or so it would appear as if the stockpile absorbed a substantial tonnage in the process of sustaining the 15 per cent level. These figures thus emphasize the extent to which U.S. stockpiling of lead has become a factor in stabilizing world prices at a level dictated by Washington. Moreover, this involvement in the market is one from which the U.S. administration has now apparently no escape in the forseeable future.

The G.S.A. has again taken all the lead on offer and it is believed that it has purchased 10,000 tons for the stockpile.

TIN.—Speculation regarding the future of the I.T.A. seems now to be centred primarily on how soon ratification may reasonably be hoped for, as it seems to be generally accepted that the necessary number of votes will eventually be forthcoming. Among producers the biggest outstanding block of votes are the 213 carried by Indonesia. There the expiry of the American contract at the end of this month may bring the Government's attention, which of late has been preoccupied with internal revolts, back to economic realities. It is understood that Belgium intends to ratify both for the Congo as a producer and for herself; which with Indonesia would ensure the necessary 90 per cent of producers' votes.

As a consumer Belgium only carries 13 votes, and at the moment attention is focused principally on France where the perennial crisis threatens to defer ratification indefinitely. As, however, Italy, the Netherlands, and Spain are all understood to be intending to ratify as soon as the necessary legislation has been passed, these countries together with Belgium and any one other consumer member would be sufficient to ensure ratification without waiting until France can find a Government to remain in power sufficiently long to enact the necesssary measures.

In any event, there must now be a most unfortunate lag between the expiry of U.S. contracts with Indonesia and Bolivia and the coming into operation of the Agreement. The future of the Texas smelter is, as this time last year, being investigated by both Houses of Congress and although no provision has been made in the President's budget for its operation

beyond the end of June, the possibility of its retention and the continuation of stockpiling for a further period cannot be entirely discounted. However the parties to the I.T.A., who in all conscience have had time enough to bring the Agreement into force, must count themselves extremely fortunate if the U.S. Administration decides to continue to bolster the market against its inclination.

News comes from Kuala Lumpur of experimental dredging on the sea bed off the coast of central Malaya. Samples are being brought up from a depth of about 100 ft. and if tests are satisfactory regular mining operations are expected to begin with grabs.

ZINC.—As with lead, the statistical picture for zinc in 1954, is overshadowed by the incompatible problems of American dependence on overseas supplies and the need for price support through stockpiling to sustain domestic producers. According to B.M.C. estimates world mine production was virtually unchanged at 2,390,000 l.tons, and although the Bureau of Mines reports a sharp decline in U.S. production to 415,000 l.tons (the lowest output for twenty years and 15 per cent below 1953), this deficiency was made up by a fairly evenly spread increase in production throughout the world, aside from Canada, the world's second largest producer which recorded a 10 per cent decrease at 320,000 tons.

According to the B.M.C. Review consumption of new metal outside the U.S. rose by some 200,000 tons last year to around 1,500,000 tons. There was thus a surplus of nearly 500,000 tons, most of which found its way into the States. Although this figure was about 200,000 tons less than in 1953, consumption of slab zinc in the States was itself down by about 100,000 tons at 782,000 tons compared with 880,000 tons. With imports thus falling off more rapidly than consumption, the rise in U.S. stocks of slab zinc was halted during the year, reaching a peak of 187,000 tons in May and falling to 111,000 tons by the year end, largely due to an absorption into the stockpile of some 80,000 tons over the latter part of the year.

The G.S.A. has again taken all the zinc on offer and it is believed that it has purchased 15,000 tons for the stockpile.

As in the case of lead, it is difficult to see how the Administration can now get from under its price support programme, and the American taxpayer seems destined to be the world's stockholder in perpetuity. It may well be wondered how soon a point will be reached where further growth in stockpiles will become either politically or economically embarrassing to the point where prices must be allowed to drop back even at the expense of the domestic producer.

ALUMINIUM.—In the U.K. the market position remains extremely tight with producers voluntarily operating quota schemes for their regular customers. In the States, both the aluminium producers and the government continue to discount consumers' apprehensions of an acute scarcity later this year and are pointing to the tapering off of defence requirements foreshadowed for the second quarter. Requests from consumers that the O.D.M. should scale down or temporarily suspend stockpile buying have been rejected.

The London Metal Market

(From Our Metal Exchange Correspondent)

The tin market has remained steady, and the large order from the Argentine was taken by a New York merchant and had no effect on prices here. In general, demand elsewhere remained satisfactory, and on Thursday morning the Eastern price was equivalent to £723½ per ton c.i.f. Europe.

The lead and zinc markets have again been featureless and price movements have been more or less in sympathy with that of copper. Demand on both sides of the Atlantic remains good, and supplies of high-grade zinc are becoming even more scarce.

The copper market has been extremely active with a new record high price being paid at the end of last week, but on Monday the market opened appreciably lower, and as the recovery during that day was of a very minor nature consumer buying dried up, and as Tuesday morning's market showed no signs of further recovery selling orders predominated in the afternoon, and on Wednesday morning an accumulation of selling orders caused a rapid fall in the price to £321 per ton. At this level, however, some buying orders came into the market, as people realized that what had taken place was probably only a technical recession following the recent very steep advance and that the basic factors of the copper situation had not altered in any way. The recovery continued on Wednesday afternoon, and it is now expected that the price will once again rise for a period. In America the recession in scrap prices which followed the announcement of the partial export prohibition did not continue, and prices have in fact firmed up as numerous consumers are now trying to stock themselves for the second quarter by buying scrap and having it refined: should there be any adverse political news there is a distinct possibility that the domestic price would once more be raised.

Closing prices and turnovers are given in the following table:

	February 10		February 17	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£715	£716	£707	£708
Three months	£717½	£718	£711	£712
Settlement	£716		£708	
Week's turnover	740 tons		790 tons	
Lead				
Current half month	£104½	£104¾	£102¾	£103
Three months	£104½	£104¾	£102¾	£102¾
Week's turnover	2,550 tons		2,425 tons	
Zinc				
Current half month	£91	£91½	£89¼	£89¾
Three months	£88¼	£88½	£87¼	£87½
Week's turnover	4,300 tons		5,300 tons	
Copper				
Cash	£360	£361	£338	£339
Three months	£343	£343½	£324	£325
Settlement	£361		£339	
Week's turnover	7,050 tons		9,700 tons	

OTHER LONDON PRICES — FEBRUARY 17

ANTIMONY

English (99%) delivered, 10 cwt. and over ... ... £210 per ton
Crude (70%) ... ... £200 per ton
Ore (60% basis) ... ... 22s./24s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) ... ... £519 per ton

OTHER METALS

Aluminium, 99.5%, £163 per ton
Bismuth (min. 2 cwt. lots) 16s. lb.
Cadmium (Empire), nominal
Chromium, 6s. 5d./7s. lb.
Cobalt, 21s. lb.
Gold, 251s. 11d. f.oz.
Iridium, £32 oz. nom.
Magnesium, 2s. 4d. lb.
Manganese Metal (96%-98%) £225/£262
Osmiridium, £40 oz. nom.
Osmium, £35 oz. nom.
Palladium, £6 15s. oz.
Platinum, £27/£27 15s.
Rhodium, £41
Ruthenium, £16 oz.
Quicksilver, £109-£110 ex-warehouse
Selenium, 43s. nom. per lb.
Silver, 74½d. f.oz. spot and 74d. f'd
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC

Bismuth ... ... 65% 8s. 6d. lb. c.i.f.
60% 8s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (semi-friable) 48% £12 12s. 6d. per ton c.i.f.
" Refractory 45% ... £12 5s. 0d. per ton c.i.f.
" Smalls 42% ... £8 17s. 6d. per ton c.i.f.
Baluchistan Metallurgical ... £13 5s. per ton c.i.f.
Magnesite, ground calcined ... £26-£27 d/d
Magnesite, Raw ... ... £10-£11 d/d
Molybdenite (85% basis) ... 105s. 3d.-108s. 1d. per unit c.i.f.
Wolfram and Scheelite (65%) ... 260s./265s.
Tungsten Metal Powder (98% Min. W.) ... 20s. 7d. nom. per lb. (home)
Ferro-tungsten ... ... 17s. 7d. nom. per lb. (home)
Carbide, 4-cwt. lots ... ... £37 6s. 3d. d/d per ton
Ferro-manganese, home ... £54 15s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46%-48%) ... ... 66d./68d. per unit nom.
Brass Wire ... ... 3s. 1¼d. per lb. basis
Brass Tubes, solid drawn ... 2s. 6½d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

The stock market presented an uneasy appearance during the past week. The Chancellor's warning concerning his intention to curb inflation and the continued weakness of the pound sterling abroad caused this. Another increase in the bank rate is anticipated and on Thursday events will be watched with particular interest. These factors brought about a sharp and continued fall in gilt-edged and other fixed interest stocks. On the credit side, the Exchequer has now achieved an overall revenue surplus of £82,600,000 against a deficit of £138,100,000 at this time last year. Industrials were naturally unsettled but despite some marking down a firm undertone was noticeable in the best stocks which appear tightly held. It is interesting to note that yields on many blue-chip equities are now below those obtainable on undated gilt-edged securities.

Kaffirs were more active and many good rises were recorded. Several general factors aided this development. Firstly, the movement of the native population from the Sophiatown slum caused little trouble; secondly, the Rand native labour returns for January disclose figures slightly higher than the peak last May and well above those for January, 1954. Thirdly, the easier trend of sterling has brought about another small increase in the gold price.

In the finance group, Paris buying sent Rand Selection ahead and other favourites were mostly higher on balance. Profit-taking in Consolidated Mine Selection brought the shares back from their recent high level.

Many individual Rand mines advanced and good gains were recorded by most of the older properties. These especially stand to benefit from the labour and gold price factors mentioned above. Inquiry for uranium producers coming from Johannesburg stimulated Randfontein and West Rand Consolidated. Among developing properties, buyers came in for Doornfontein, Buffelsfontein and Vaal Reefs, the Cape being particularly interested in the first-named company.

There was less activity in the Orange Free State group although some of last week's losses were recovered. St. Helena were a special feature due to rumours of good development results near the Western Holding boundary. Harmony were also singled out for attention due to the uranium factor, but elsewhere changes were insignificant.

West Africans were quiet but Ashanti went ahead. The market was still reported to be short of stock and the appearance of small buyers was a signal for marking up the price. The profits disclosed in the December quarter results of the Western Selection Group all showed declines, with the notable exception of Amalgamated Banket. This company's reorganization is now really beginning to pay off and profits went ahead by some £43,000.

Western Australia and miscellaneous gold shares were idle with few changes. Gold Mines of Kalgoorlie, however, declined on account of the company's plans to develop and co-ordinate their newly acquired properties.

Diamonds suffered a sharp setback. The news that the General Electric Company of America has succeeded in manufacturing small industrial stones, brought in selling from Wall Street. Reports that these cost about twice as much to produce as the natural stone failed to curb the trend.

Coppers were a good feature. The metal, after rising to a record high price, fell back sharply on news of the continued drift back to work by native labour in Rhodesia. All leading shares were favoured except Rhodesia Katanga which suffered from profit-taking after their recent rise. Messina gained the turn on the novel method of raising fresh capital to open up the company's new areas in Southern Rhodesia.

Eastern tin shares were erratic and quiet trading conditions prevailed in the face of the easier metal price. Nigerians were lower, many being quoted ex dividend. News that the government are altering their tungsten selling policy stimulated Beralts.

FINANCE	Price Feb. 16	+ or — on week
African & European	3½	+ ½
Anglo American Corpn.	8½	+ ¼
Anglo-French	25/7½	+ 7½d
Anglo Transvaal Consol.	30/-	+ 1/3
Central Mining (£1 shrs.)	40/3	+ 9d
Consolidated Goldfields	60/7½	+ 10½d
Consol. Mines Selection	49/4½	— 1/10½
East Rand Consols.	2/10½	
General Mining	4½	
H.E. Prop.	9/6	
Johnnies	43/-	+ 9d
Rand Mines	3½	
Rand Selection	45/7½	+ 3/11½
Union Corporation	37/3	
Vereeniging Estates	4 ⅛	
Writs	40/3	+ 3d
West Wits	40/3	+ 9d
RAND GOLD		
Blyvoors	30/-	
Brakpan	7/6	
Buffelsfontein	34/-	+ 1/9
City Deep	13/9	+ 6d
Consol. Main Reef	20/7½	+ 7½d
Crown	44/4½	+ 1/3
Daggas	61/10½	+ 4½d
Dominion Reefs	35/6	+ 6d
Doornfontein	31/9	+ 1/3
Durban Deep	31/3	+ 7½d
E. Champs	9/3	
E. Daggas	10/6	+ 3d
E. Geduld (4s. units)	28/9	+ 1/3
E. Rand Props	2½	+ ⅛
Geduld	3¼	+ ⅛
Govt. Areas	11/-	+ 3d
Grootvlei	19/9	+ 6d
Hartebeestfontein	43/9	+ 6d
Libanon	8/10½	+ 1½d
Luipaards Vlei	22/9	+ 9d
Marievale	19/6	+ 3d
New Kleinfontein	9/9	+ 3d
New Pioneer	17/-	+ 3d
Randfontein	67/6	+ 2/6
Robinson Deep	19/3	+ 6d
Rose Deep	13/3	+ 9d
Simmer & Jack	4/3	+ 3d
S.A. Lands	23/11½	+ 7½d
Springs	3/11½	+ 1½d
Stilfontein	26/3	+ 3d
Sub Nigel	37/6	+ 7½d
Vaal Reefs	34/9	+ 1/-
Van Dyk	5/9	+ 9d
Venterspost	12/-	+ 9d
Vlakfontein	17/9	+ 6d
Vogelstruisbult	34/-	+ 9d
West Driefontein	54½	+ ⅛

RAND GOLD contd.	Price Feb. 16	+ or — on week
W. Rand Consolidated	48/1½	+ 1/3
Western Reefs	45/-	+ 7½d
O.F.S. GOLD		
Freddies	6/1½	+ 4½d
Freddies Consolidated	12/9	+ 6d
F.S. Geduld	5½	+ ⅛
Geoffries	16/9	+ 3d
Harmony	36/6	+ 1/-
Loraine	13/3	— 9d
Lydenburg Estates	23/9	— 1/10½
Merriespruit	12/1½	+ 1½d
Middle Wits	19/-	
Ofsits	3½	
President Brand	71/10½	— 7½d
President Steyn	43/6	+ 6d
St. Helena	30/7½	+ 3/7½
Virginia Ord.	16/3	+ 7½d
Welkom	27/6	+ 9d
Western Holdings	4½	— ½
WEST AFRICAN GOLD		
Amalgamated Banket	2/4½	
Ariston	6/9	
Ashanti	25/-	+ 9d
Bibiani	5/-	
Bremang	1/4½	
G.C. Main Reef	3/7½	— 1½d
Konongo	2/4½	— 1½d
Lyndhurst Deep	1/3	
Marlu	1/3	
Taquah	3/-	
Western Selection	10/6	
AUSTRALIAN GOLD		
Gold Mines of Kalgoorlie	13/6	— 1/1½
Great Boulder Prop.	8/3	
Lake View & Star	15/10½ x D	— 4½d
Mount Morgan	20/9XD	— 6d
North Kalgurli	7/9XD	— 9d
Sons of Gwalia	6/3	— 3d
Western Mining	9/9	— 4½d
MISCELLANEOUS GOLD		
Cam & Motor	9/4½	+ 4½d
Champion Reef	4/-	
Falcon Mines	7/-	
Globe & Phoenix	24/3	
G.F. Rhodesian	6/9	
Motapa	1/7½	
Mysore	5/-	
Nundydroog	6/3	
Ooregum	4/4½	— 1½d
St. John d'El Rey	13/3	+ 6d
Zams	46/6	

DIAMONDS & PLATINUM	Price Feb. 16	+ or — on week
Anglo American Inv.	8½XD	— 1½
Casts	26/9	— 2/-
Cons. Diam. of S.W.A.	8½	
De Beers Defd. Bearer	6½	— ⅜
De Beers Pfd. Bearer	17½	+ ⅛
Pots Platinum	8/9	— 6d
Waterval	16/-	
COPPER		
Bancroft	45/-	+ 9d
Chartered	116/3	+ 1/10½
Esperanza	5/6	— 1½d
Messina	7½	+ ⅛
Nchanga	12½	+ ⅛
Rhod. Anglo-American	101/3	+ 4/3
Rhod. Katanga	23/-	— 3/6
Rhodesian Selection	36/6	+ 1/10½
Rhokana	36¼	+ 1⅛
Rio Tinto	50	+ 1½
Roan Antelope	26/9	+ 6d
Selection Trust	75/9	+ 1/3
Tanks	6⅜	+ ⅛
Tharsis Sulphur Br.	7¼	— ¼
TIN (Eastern)		
Ayer Hitam	31/3	— 3d
Gopeng	7/7½	— 1½d
Hongkong	8/4½	+ 1½d
Ipoh	21/-	— 3d
Kamunting	7/6XD	— 3d
Kepong Dredging	3/6	
Kinta Tin Mines	11/6	+ 3d
Malayan Dredging	9/3	+ 1½d
Pahang	11/6	— 6d
Pengkalen	9/7½	+ 1½d
Petaling	8/3	
Rambutan	18/-	
Siamese Tin	6/1½	— 4½d
Southern Kinta	18/-XD	— 4½d
S. Malayan	8/3	
S. Tronoh	11/9	+ 3d
Sungei Kinta	11/6	
Tekka Taiping	6/1½	+ 1½d
Tronoh	8/7½	+ 4½d
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	14/7½	— 3d
Beralt Tin	30/4½ XD	+ 4½d
Bisichi	7/-	+ 3d
British Tin Inv.	22/6	+ 3d
Ex-Lands Nigeria	3/-	
Geevor Tin	13/6XD	— 4½d

TIN (Nigerian and Miscellaneous) contd.	Price Feb. 16	+ or — on week
Gold & Base Metal	2/9	
Jantar Nigeria	8/3	— 3d
Jos Tin Area	14/-XR	
Kaduna Prospectors	2/7½	
Kaduna Syndicate	2/6	
London Tin	7/10½	+ 6d
United Tin	3/-	— 1½d
SILVER, LEAD, ZINC		
Broken Hill South	57/6	— 7½d
Burma Corporation	3/3	+ 1½d
Consol. Zinc	49/6XD	+ 2/3
Lake George	13/-	+ 2/-
Mount Isa	51/9XD	— 3d
New Broken Hill	38/6XD	— 6d
North Broken Hill	76/-	+ 1/9
Rhodesian Broken Hill	14/4½	+ 1½d
San Francisco Mines	24/6	— 6d
Uruwira	6/-	
MISCELLANEOUS BASE METALS & COAL		
Amal. Collieries of S.A.	48/6	
Associated Manganese	40/3	
Cape Asbestos	12/1½	— 1½d
C.P. Manganese	40/6	+ 6d
Consol. Murchison	59/4½	+ 3/1½
Natal Navigation	2⅜	+ ⅛
Turner & Newall	111/9	— 6d
Wankie	17/7½	+ 1½d
Witbank Colliery	4½	
CANADIAN MINES		
Dome	$33	
Hollinger	$33½	+ 1¼
Hudson Bay Mining	$114	— ½
International Nickel	$118½	+ 3½
Mining Corpn. of Canada	£6¾	+ ⅛
Noranda	$170	+ 12
Quemont	£8½	+ ¼
Yukon	4/1½	— 4½d
OIL		
British Petroleum	81/3	— 1/3
Apex	30/3	— 9d
Attock	47/6	
Burmah	6⅛	— ⅛
Canadian Eagle	49/3	+ 1/9
Mexican Eagle	19/6	
Shell	6⅛	— ¼
Trinidad Leasehold	33/3	— 1/-
T.P.D.	25/6	— 1/3
Ultramar	33/9	+ 1/-

COMPANY NEWS AND VIEWS

Messina's Expansion Plans and "Rights" Issue

Following the announcement by the Messina (Transvaal) Development Company that an amount of £2,600,000 is to be raised by way of £1,950,000 6 per cent unsecured loan stock and 650,000 options at a price of £1 (see *Mining Journal*, February 11, p. 162), the purpose for which these funds are required is now disclosed to be in connection with the company's Mollie Section over which exclusive prospecting rights are held by Rhodesia Copper Ventures. Recent acquisition of the latter company's shares has brought Messina's holding up to 79 per cent of the issued capital.

Close investigations carried out in the Mollie Section, have led the company to the decision that the property should be put into production on a scale of approximately 2,000 tons of ore per day—a target which it is estimated will be reached by 1959. It is thought that costs would be in the region of 35s. to 40s. per ton of ore produced. Ore reserves in the section amount to approximately 16,000,000 tons assaying 1.6 per cent copper, or a total copper content of 256,000 l.tons. In addition, there is estimated to be a minimum of 366,000 tons of ore averaging 3.3 per cent Cu in the Silverside Section of the property, which so far has only been developed down to 200 feet. Further development, including surface drilling will, however, be carried out on this and other promising areas of the property concurrently with the preparation of the Mollie Section for production.

The cost of the project, which includes all pre-production and capital expenditure is estimated to be about £4,300,000. Of this sum the present issues will provide £2,600,000 and on the assumption that the options will be fully converted during 1959, a further £1,300,000 will be realized. The balance of £400,000 is to be met from the company's own resources. The proceeds of the present capital raising operations will be made available to Rhodesia Copper Ventures either by way of advances, or by further subscriptions of capital by Messina.

It is understood that although the initial allotments of loan stock and options will take the form of composite units of £4 each, the two issues are subsequently to be dealt in separately. It therefore seems that when dealings open on April 4, taking as a basis for calculation the present price of 150s. for Messina 5s. stock units, the ex-rights price might be somewhere in the region of 106s. This would make the rights worth 45s. and would mean that after allowance had been made for the £2 due to be paid in 1959, the options should stand at around 66s. each. Nevertheless, whatever view is taken of the short term market prospects—and these could involve an initial loss on the loan stock—in view of the fact that production plans envisage a virtually doubled output of copper by 1959, it would not appear unduly optimistic to look for a substantial rise in the volume of Messina ordinary units during the coming months. On any assumption of this sort the options—which will naturally move with the units—might provide a good way for the smaller investor to take an interest in Messina whose ordinary stock units are in the heavy price category.

Meanwhile operations carried out by Messina during the year ended September 30, 1954, have been maintained at very much the same level as for the previous year.

Year to Sept. 30	*L. tons ore milled** 000	*% cu.*	*L. tons Copper Produced*	*Cost per l. ton cu.* £	*Ore Tons* 000	*Res'ves % cu.*
1954	806.8	1.73	13,688	108.5	4,520.4	1.99
1953	761.1	1.84	13,664	100.4	4,068.3	2.12

*Excluding jig tailings handled, 1954—71,376 l.tons containing 398.442 tons cu. (1953—63,375 l.tons containing 366.342 tons cu.)

Dividends amounting to 370 per cent were paid on the company's issued ordinary capital of £325,000 in stock units of 5s. This compares with a total of 400 per cent previously.

Year to Sept. 30	*Total Revenue* £	*Taxation* £	*Net Profit** £	*Dividends* £	*To Reserve* £	*Carry Forward* £
1954	3,353,907	523,962	1,382,676†	1,202,500	400,000	44,078
1953	3,451,990	578,290	1,538,796	1,300,000	90,000‡	11,414

* Before deducting working expenditure, 1954—£1,379,538 (1953—£1,257,715)
† Excluding £150,000 (Nil) provision for contingencies written back, and £102,488 (Nil) profit on realization of investments
‡ Including £150,000 provision for contingencies

Meeting, March 10, Johannesburg. Commander H. F. P. Grenfell is chairman.

South West Africa Company: Revenue Falls, Dividend Raised

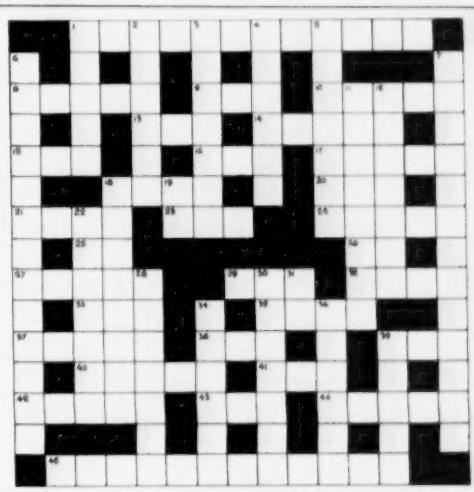
Due to a closure of the refinery of Belgochimie S.A. (now in liquidation) there was practically no production of vanadic acid by the South West Africa company during the first six months of the year ended June 30, 1954. As the proceeds from sales of this product are by far the greatest constituent of the company's revenue, it was a considerable achievement that income from other sources, which include lead and tin-tungsten concentrates, could have been raised sufficiently to prevent a substantial fall in total revenue. In fact, while the production of fused vanadic acid was less than half that of the previous year, sales of lead brought in £438,957 (£216,761), while output of tin metal and tungsten ex tin-tungsten concentrates totalled 153 tons as against only 68 tons in the preceding period, yielding £113,199 as compared with £73,937 previously.

Year to June 30	*Total Revenue* £	*Taxation* £	*Net Profit** £	*Dividends* £	*To Reserve* £	*Carry Forward* £
1954	1,140,715	108,468	72,470	36,562	44,000	51,908
1953	1,422,873	67,285 Dr.	61	29,249	Nil	24,750

* After all expenses both in London and South West Africa, including £823,965 (£1,240,991) in respect of mining, refining, prospecting, shipment, etc.

Dividends paid on the company's issued ordinary capital of £354,538 in shares of 13s. 4d. were raised to 18¾ per cent as compared with 15 per cent in respect of the previous twelve months.

The outlook for the current year would appear to be bright. The vanadium position is reported to have undergone a considerable change during the last few months and this has increased demand to such an extent that the company is finding it difficult to cope with the orders involved. Subject, of course, to there being no sudden drop in requirements, revenue in respect of the year ending June 30, 1955, from this source should

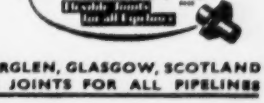


ACROSS.—1. Study this from the correct angle (12). 8. Representation (5). 9. Incision (3). 10. To Slip (5). 13. Residue (3). 14. Combination (5). 15. Extract a poor existence (3). 16. Possessive pronoun (3). 17. Old English coin (5). 18. Party strife (4). 20. A tot ? (3). 21. Very pleasant in the South of France (4). 23. Pressure in short (3). 24. Sounds close but shows contempt (5). 25. A light element (2). 26. Royal Cipher (2). 27. Dims (5). 29. Suitable (3). 32. Essential to the stage struck (4). 33. A Whip (3). 35. Half a Scottish County (4). 37. Ornamental head-dress (5). 38. Errors and omissions excepted (3). 39. Timber (3). 40. Light on the subject gives silk-like answer (5). 41. Less than the ocean (3). 42. N.Z. District (5). 43. Plant (3). 44. Hardened Pine Juice (5). 45. For precision work (12).

DOWN.—1. Delineate (5). 2. Conceive (6). 3. Exotic blooms (7). 4. Between 90° and a straight line (6). 5. Regimental banners (7). 6. Study in practical economy (4-3-6). 7. Metal process (4-9). 11. Bridle makers (8). 12. One would have to be a first-class singer here. (2-5). 18. Handled a remnant (4-1-3). 19. Ascending (2). 22. Californian bark (7). 28. Illness may make you this your work (4-3). 30. A gift (7). 31. Preposition (2). 34. Hedgehog found in Madagascar (6). 36. A sacred beetle (6). 39. To follow (5).

Solution on page 189

With the compliments of



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show a considerable improvement. In addition, shipments with a combined tin metal and tungsten content of 82 tons have already been made during the first six months of the current year and it is hoped that this figure will be considerably improved upon during the coming months.

Referring to the question of a possible transfer of control and management of the company to South West Africa, Mr. J. E. W. Lomas, the chairman, says that the matter is being very carefully considered in conjunction with auditors, solicitors and counsel. It is considered that an application for such a change can and should properly be made forthwith.

At their present price of around £3 the 13s. 4d. ordinary shares of the company yield just over 4 per cent, a return which reflects anticipation of a successful year's operations and a change of domicile. Meeting, London, February 24.

Western Selection and Development Group December Quarterlies

Most outstanding of the returns from West African gold mines in the Western Selection Group for the December quarter of 1954 was that from Amalgamated Banket Areas. During the past year the working profits earned by this mine have shown progressive increases, a trend which has again been maintained by a substantial rise over the previous quarter's figure. When compared, however, with the first three months of this company's preceding financial year, which ended on September 30, 1953, the full effect of recent advances can be clearly seen. There was a very substantial advance in the tonnage of ore milled to 251,400 tons from 200,100 tons during the December quarter of 1953, from which gold recovery rose to 40,027 oz. from the previous total of 32,379 oz. Profits from these operations were almost doubled at £106,200 as compared with £52,600. Reflecting to some extent the very solid progress which has been achieved by this mine since its extensive capital expenditure programme which involved reopening the Fanti Mine and joining it, together with the Tamsoo Mine to the central mill, the 3s. ordinary shares which now stand in the region of 2s. 7d. to yield just under 6 per cent have shown considerable improvement from their low point of 1s. 3d. in 1954.

Of the remaining companies in the group—all of whose profits were lower during the December quarter than those earned during the preceding three months—the confirmation by Ariston that the new Central shaft winder was put into commission at the end of January was particularly encouraging. Unfortunately, however, some delay was encountered in completing this installation due to an electrical fault which developed when the winder had its first run last November. This involved the special despatch of an engineer by the manufacturers to the Gold Coast. But now that the winder is in commission it is to be expected that the planned tonnage throughput of 40,000 tons will soon be achieved. Indeed, the results of the past quarter, which represent the first three months of this company's financial year compare very favourably with the corresponding quarter in the preceding year. From a total of 108,600 tons milled (93,500 tons) a total amount of 32,404 oz. of gold (29,623 oz.) were recovered. Profits earned during the past quarter rose to £150,700 as against £124,200 during the December quarter of 1953.

Company	*Mar. qtr. 1954*	*June qtr. 1954*	*Sept. qtr. 1954*	*Dec. qtr. 1954*
	£	£	£	£
Amalgamated Banket ...	51,294	79,954	102,980	146,236
Ariston Gold Mines ...	149,954	165,418	178,471	153,046
Bremang Gold	18,181*	907	36,367	20,350
Gold Coast Main Reef ...	54,665	45,390	60,383	49,871
Marlu Gold	29,840	28,824	45,492	22,626

* Loss

From Bremang it is reported that the balance of materials required to complete the reassembly of Dredge No. 1 arrived in November, and it is thought that reconstruction would have been completed by the middle of the present month from which time four dredges would again be in operation. Owing to the increased tonnage of ore from the lowest level at Buesichem, which is highly graphitic and carries appreciable quantities of sulphides, the percentage of gold recovered by Marlu showed a fall. It is, however, hoped to give stockholders a full and up to date account of the company's position at the annual meeting next month.

Geita Earns Less

During the year ended June 30, 1954, Geita Gold Mining Company, the Tanganyika property of which Kentan Gold Areas owns over 76 per cent, earned an operating profit of £7,646 as compared with £41,698 during the preceding 12 months. After expenses and a credit of £4,000 (£9,017) received on account of royalty refunds due, an amount of £8,397 remained to be carried forward. Tonnage milled by the company rose to 256,500 tons from 252,000 tons while there was also an increase in the yield of gold per ton to 3.04 dwt. from 2.93 dwt. On the other hand, costs rose sharply to 38.17s. from 35.92s. previously, due partly to the advance in development accomplished to 8,267 feet from 5,635 feet excluding that footage which was charged to capital account.

It is not possible, however, to make a strict comparison between the past year's results and those of the preceding period, for work during the past year was largely directed towards reconstruction and development under the current extensive capital programme designed to raise the mill throughput to 30,000 tons monthly. In addition, the ineffective operation of the company's aerial ropeway during the year seriously disrupted work forcing the decision during February to recondition it completely. This necessitated considerable reorganization of mining operations which adversely affected working costs. Furthermore, the higher rate of development work undertaken for the purpose of building up ore reserves was also responsible for a proportion of the increased costs. The higher activity in this sphere was reflected in an increase of 124,000 tons in ore reserves which brought the total at the year end up to 1,364,000 l.tons with an average value of 4 dwt. per ton.

A point of particular interest concerning the year's operations was the low percentage of payable ore obtained from the total sampled. This, as explained by the chairman of the company, Lord Grey, was due to the method of reporting development payability employed by the company which has been based on sampling results in lateral development headings only. As this method is liable to be misleading it is intended that as from July 1, 1954, it will be altered to conform with general practice where wide ore bodies are encountered.

The current year will be one of considerable interest to shareholders for it is expected that the expansion programme to mill 30,000 tons monthly will shortly be completed. At this stage, according to previous estimates made by the company's consulting engineers, New Consolidated Gold Fields, monthly working profits should start to rise towards an ultimate level in the region of £6,600 per month. Meanwhile, results for the first five months of the current financial year have shown no substantial increase over those of the previous corresponding period. From a total of 111,100 tons of ore milled (111,800 tons) a total of 17,076 oz. of gold (16,905 oz.) has been produced.

As it is the intention of both the chairman and one other director, Mr. T. W. Easby, to visit the Geita property before the meeting which is to be held in London on March 24, it is possible that prior to or on that date a full account of the company's present position will be disclosed.

Company Shorts

British Tin Investment Pays 6¼ Per Cent Less.—A preliminary profit statement from the British Tin Investment Corporation has disclosed that provisional net profit after tax for the twelve months ended December 31, 1954, fell to £292,141 from £366,725 in respect of the previous year. However, it would be incorrect to make a strict comparison between these two figures as the 1953 total included a credit of £90,580 being the balance of a provision made in 1952 for E.P.L. which was no longer required. As it was due to this receipt that a special interim dividend of 7 per cent was paid in respect of the year 1953 total distribution for the last financial year has been correspondingly decreased. Accordingly, dividends on the issued ordinary capital of £2,105,086 in shares of 10s. were reduced to 24 per cent from 30½ per cent absorbing £277,871 compared with £353,128. Mr. S. H. Smith is chairman.

Fanti Earns More — Pays More.—Besides increasing its dividend from 6½ to 7½ per cent on the issued capital of £557,000 in stock units of 8s., Fanti Consolidated Investment Company has doubled its bonus at 5 per cent bringing total distribution for the year ended December 31, 1954, to 12½ per cent. This compares with the previous year's total of 8¼ per cent made up of dividend at 6¼ per cent and bonus of 2½ per cent.

Year to Dec. 31	*Total Revenue*	*Taxation*	*Net Profit*	*Dividend**	*To Reserve*	*Carry Forward*
	£	£	£	£	£	£
1954	129,378	75,816	53,562	38,294	15,000	18,850
1953	85,798	40,442	45,356	26,805	15,000	18,582

* Including bonus

Mr. J. E. W. Lomas is chairman and managing director.

DECEMBER MINE RETURNS

WEST AFRICAN GOLD

Company	December, 1954 Tons (000)	Yield (oz.)	Profit (£000)	Months since year end	Current Financial Year Total to date Tons (000)	Yield (oz.)	Profit (£000)	Last Financial Year Total to date Tons (000)	Yield (oz.)	Profit (£000)
Amal. Banket	84	13,388	41·8	3	251	40,027	106·2	200	32,379	52·6
Ariston Gold	37	10,800	48·0	3	109	32,404	150·7	94	29,623	124·2
Ashanti	25	16,371	70·9	3	78	49,130	210·3	72	45,733	189·0
Bibiani (1927)	29	6,250	14·2	3	89	19,350	45·2	90	18,955	20·2
Bremang*	623	†2,850	5·9	12	6,336	29,267	40·6	6,452	30,685	127·4
G.C.M. Reef	10	3,927	11·7	6	59	24,239	86·7	54	21,817	64·2
Konongo	4	3,188	15·0	3	11	9,565	46·3	8	7,724	37·7
Lyndhurst Deep	1	1,160	6·7	3	3	3,463	19·8	3	3,653	17·9
Marlu Gold	33	2,167	4·0	3	106	8,371	22·6	119	12,444	50·5
T. & Abosso	30	5,867	·9	9	254	53,231	29·7	226	44,608	90·5

* Cu. yd. dredged
† Includes 130 oz. from clean-up

Profit figures include premium revenue.

SOUTHERN RHODESIAN GOLD

Company	December, 1954 Tons (000)	Yield (oz.)	Profit (£000)	Months since year end	Current Financial Year Total to date Tons (000)	Yield (oz.)	Profit (£000)	Last Financial Year Total to date Tons (000)	Yield (oz.)	Profit (£000)
Arcturus	3·2	902	3·3	6	18·2	5,526	19·2	18·4	—	17·2
Cam & Motor	24·0	7,588	41·1	6	144·5	45,350	249·0	144·7	45,125	268·5
Falcon Mines	17·2	3,131	†12·9	3	52·1	9,527	34·5	49·3	8,027	18·0
Globe & Phoenix	6·0	3,658	24·7	12	72·8	43,086	281·0	72·2	41,059	265·9
Motapa Gold*	17·7	2,468	2·5	12	218·2	29,996	38·5	243·2	28,599	18·2
Muriel Mine	2·9	1,032	10·0	6	18·7	5,789	60·4	11·2	—	41·4
Rezende	1·5	290	L 3·0	12	73·0	11,874	L 13·7	78·2	13,362	10·7
Tebekwe	7·5	956	1·3	6	44·9	6,012	7·7	48·9	—	15·6

* Excluding premium gold sales. † Including £2,623 from accumulated concentrates which were re-treated in Roasting Unit. Also £575 additional revenue in respect of gold produced during October. L indicates a loss.

AUSTRALIAN GOLD

Company	4 weeks to Nov. 30 1954 Tons (000)	Yield (oz.)	4-weekly period since year-end	Current Financial Year Total to date Tons (000)	Yield (oz.)	Last Financial Year Total to date Tons (000)	Yield (oz.)
Boulder Perseverance	10·0	2,299	9	92·5	21,554	90·5	22,314
Central Norseman	12·2	4,886	9	109·2	56,915	106·7	51,769
Central Victoria*	125·3	530	9	1374·2	3,939	1884·1	6,556
Golden Horse Shoe†	43·1	796	11	790·1	8,959	849·3	8,435
G.M's of Kalgoorlie	15·4	3,964	9	137·1	38,361	135·4	39,384
Morning Star	1·3	822	9	12·2	8,384	12·8	13,109
New Coolgardie	5·8	3,044	9	46·1	23,335	48·3	22,580
North Kalgurli	19·3	4,056	11	222·5	51,285	245·2	56,783
Sons of Gwalia	10·4	2,535	11	105·0	24,059	105·0	24,048
South Kalgurli	7·6	1,770	9	71·2	14,908	79·3	15,827

* Cu. yd. dredged † Four-weekly period ending December 6

INDIAN GOLD

Company	December, 1954 Tons (000)	Yield (oz.)	Months since year end	Current Financial Year Total to date Tons (000)	Yield (oz.)	Last Financial Year Total to date Tons (000)	Yield (oz.)
Champion Reef	13	5,057†	12	177	69,571	139	54,962
Mysore	19	5,470	12	219	78,254	188	70,593
Nundydroog*	20	5,665	12	252	71,941	238	65,640
Ooregum	—	140	12	—	1,715	67	19,929

* Includes tailings † Includes 38 oz. from clean-up

Mining Matters

Mond Nickel Fellowships, 1955.—The Mond Nickel Fellowships Committee now invites applications for the award of Mond Nickel Fellowships for 1955. The main object of these Fellowships is to enable selected applicants of British nationality and educated to University degree or equivalent standard to obtain additional training and wider experience in industrial establishments, at home or abroad, so that if they are subsequently employed in executive or administrative positions in the British Metallurgical Industries, they will be better qualified to appreciate the technological significance of research and to apply its results.

There are no age limits, though awards will seldom be made to persons over 35 years of age. Each Fellowship will occupy one full working year. It is hoped to award five Fellowships each year of an approximate value of £900 to £1,200 each.

Applicants will be required to define the programme of training in respect of which they are applying for an award, as well as particulars of their education, qualifications and previous career. Full particulars and forms of application can be obtained from The Secretary, Mond Nickel Fellowships Committee, 4 Grosvenor Gardens, London, S.W.1.

Completed application forms will be required to reach the Secretary of the Committee not later than June 1, 1955.

International Ore Dressing Congress.—An International Ore Dressing Congress is to be held at Goslar, Harz, Germany, from May 8 to May 11, 1955. This congress follows that held in Paris in September, 1953, when it was decided to hold international ore dressing congresses every two years. Responsibility for the arrangement of this year's congress has been assumed by Gesellschaft Deutscher Metallhutten und Bergleute (Institution of German Metallurgical and Mining Engineers), and the congress will be preceded on May 6 and May 7 by the annual general meeting of the G.D.M.B.

Some twenty lectures on current ore dressing problems will be delivered, followed by detailed discussion, and all lectures and discussions will be heard in English, French and German by simultaneous interpretation. Each afternoon half-day excursions will be made to ore dressing plants and installations in the vicinity of Goslar while at the conclusion of the congress a three-day visit to ore dressing plants and research stations is being planned on May 12 to May 14, for which additional charge will be made. A charge of 60 DM will be made for each person attending the congress, for ladies 30 DM. A special programme is being arranged for ladies. The secretary of the congress is Dipl.-Ing. W. Koch, G.D.M.B., Clausthal-Zellerfeld 1, Germany. Postfach 51.

TECHNICAL MINING ASSISTANT required by Copper Mining Company in India. Applicant should hold a recognized mining degree and preferably be single. Salary starts at £675 p.a. rising to £725 in the third year with cost-of-living and servant allowances of £141 p.a. In addition, an annual bonus is paid, and a Provident Fund is in operation. Three years' contract, with leave on full pay after 2½ years in India. Free furnished accommodation with fuel and light. Apply, giving full particulars, to Box 540, Walter Skinner Ltd., 20 Copthall Avenue, London, E.C.2.

CORRECT SOLUTION TO "UNICONE" CROSSWORD No. 2 APPEARING ON PAGE 187

ACROSS: 1, Trigonometry; 8, Image; 9, Cut; 10, Slide; 13, Ash; 14, Union; 15, Eke; 16, Its; 17, Groat; 18, Feud; 20, Nip; 21, Nice; 23, P.S.I.; 24, Sneer; 25, Al; 26, E.R.; 27, Mists; 29, Apt; 32, R.A.D.A.; 33, Cat; 35, Ross; 37, Tiara; 38, E.O.E.; 39, Elm; 40, Rayon; 41, Sea; 42, Otago; 43, Rye; 44, Resin; 45, Surfacetable.

DOWN: 1, Trace; 2, Ideate; 3, Orchids; 4, Obtuse; 5, Ensigns; 6, Time and Motion; 7, Heat Treatment; 11, Loriner; 12, In Opera; 18, Felt a Rag; 19, Up; 22, Cascara; 28, Stay Off; 30, Present; 31, To; 34, Tenrec; 36, Scarab; 39, Ensue.

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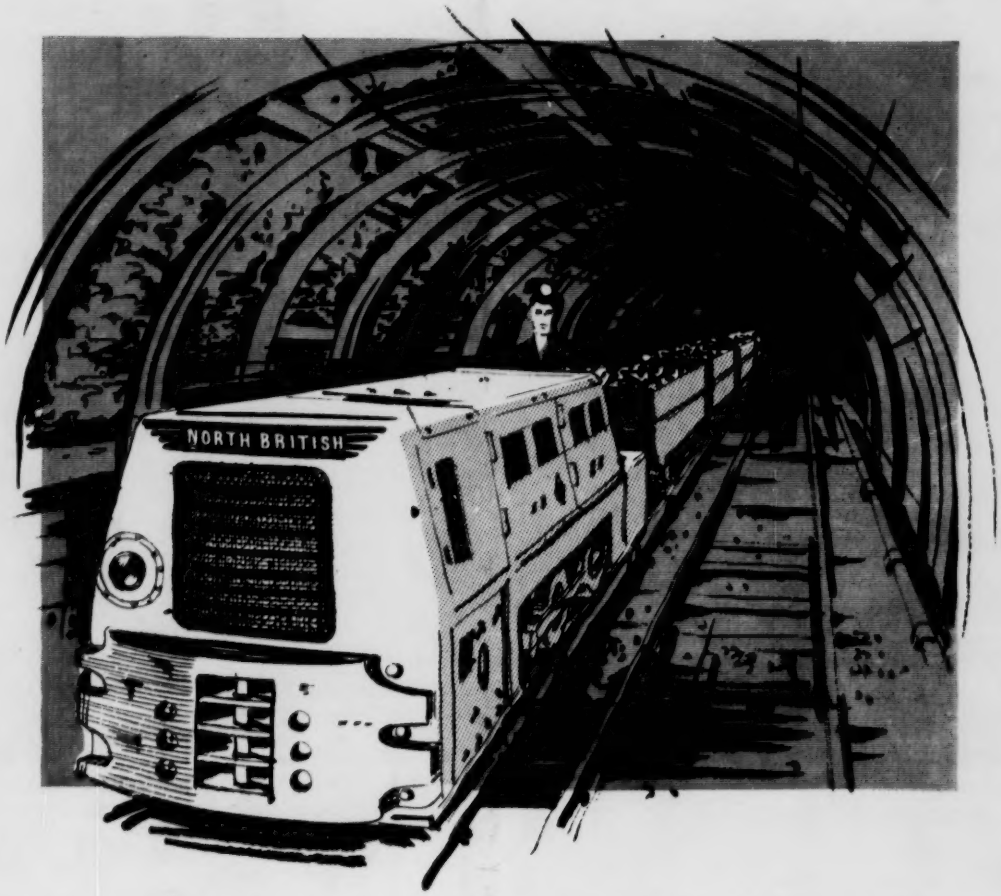

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